THE INSTITUTE OF PETROLEUM REVIEW

cal. 14 #162

June 1960

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SERCK QUALITY TECHNICAL TUBES

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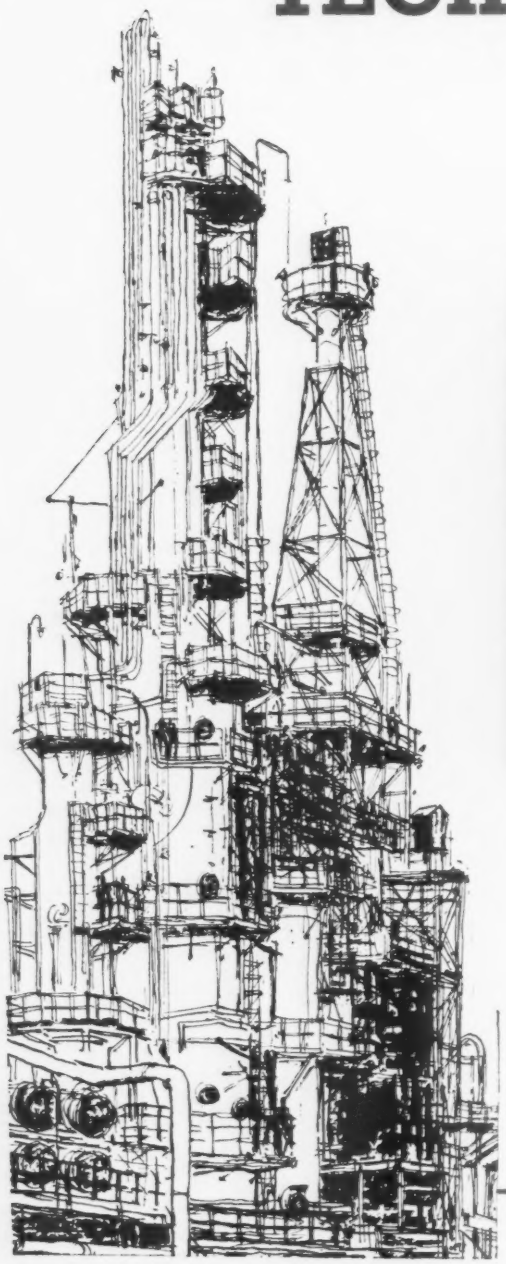

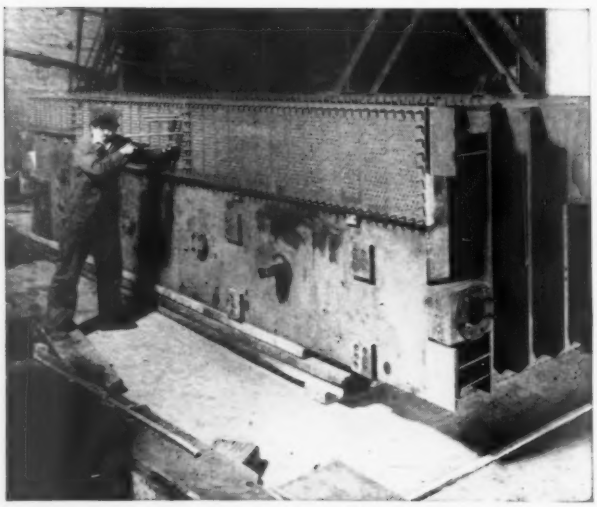

A 50,000 gal. day evaporator for a refinery under construction by Procon (Great Britain) for Anglo Ecuadorian Oilfields, Ltd., being tubed with SERCKALBRA.
(Photograph by courtesy of Richardson, Westgarth and Co., Ltd.)

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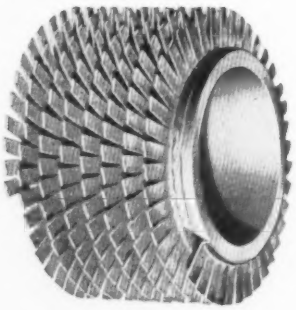

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On the trail of oil

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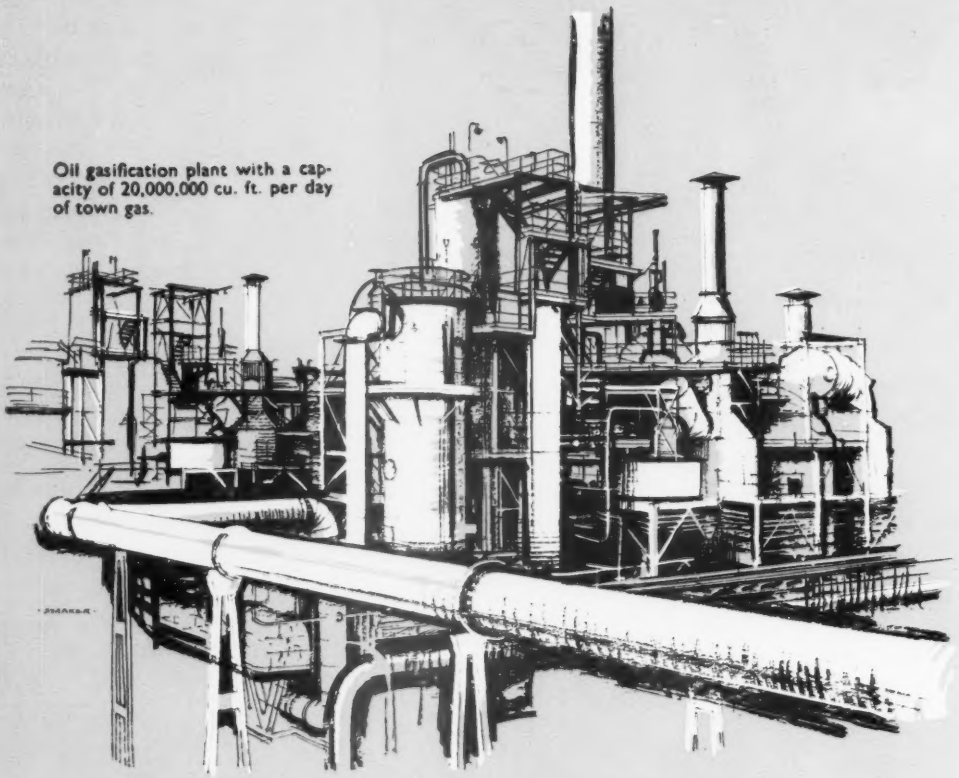
It is oil that keeps the modern world turning, and there is no room for compromise in the demands that are made on the oil industry. Mobil stands for an organisation that, for nearly a century, has had an honoured name in this industry.

Mobil

1960

IP



Oil gasification plant with a capacity of 20,000,000 cu. ft. per day of town gas.

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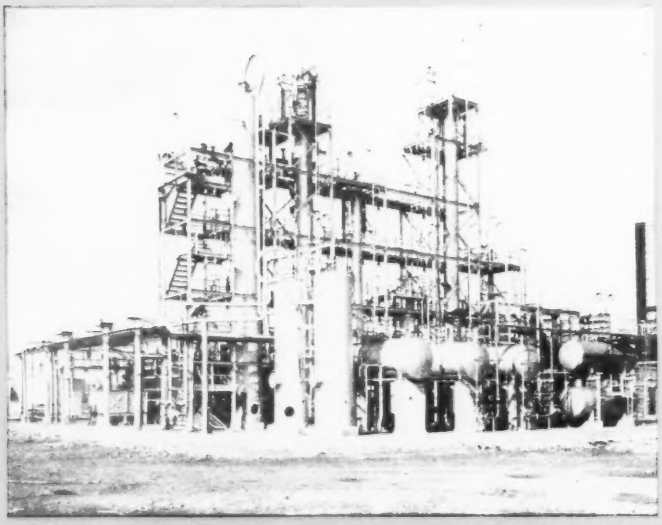
Complete process plant is designed, supplied and erected for the gas, chemical, petro-chemical and petroleum industries.

Amine washing plant with mercaptan removal unit treating hydrocarbon streams at a refinery.



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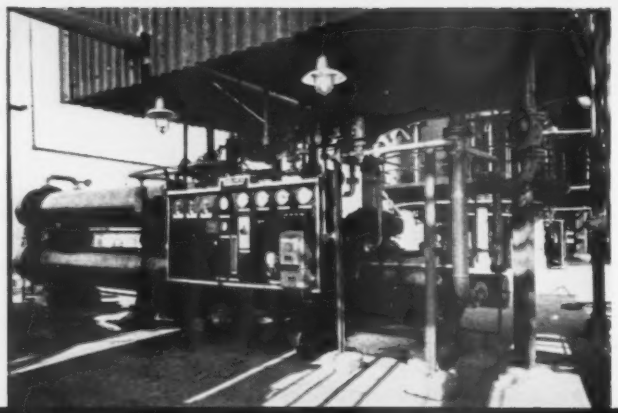
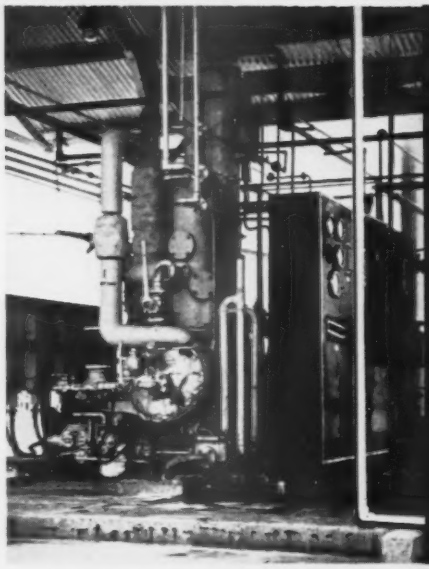


Whitegate Refinery

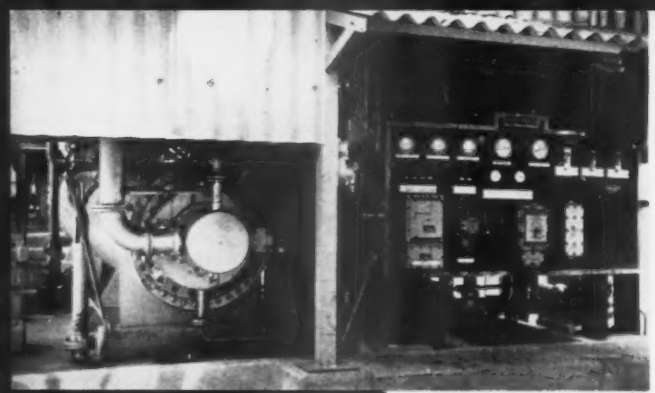
A 30,000 c.f.h. propane fired Inert Gas Generator installed at the Whitegate Refinery of the Irish Refining Company Limited. This generator supplies gas used on the catalyst reforming unit during the regeneration of catalyst.

Mina al Ahmadi Refinery

A 530 c.f.h. Holmes-Kemp Nitrogen Generator installed at the Mina al Ahmadi Refinery of the Kuwait Oil Company Limited. This generator produces a high purity nitrogen (99.8%) which is used for general purging purposes on the Platformer unit.



controlled atmosphere generators



Fawley Refinery

A 60,000 c.f.h. refinery gas fired Inert Gas Generator installed at the Fawley Refinery of the Esso Petroleum Company Limited. This is a variable output generator and is fitted with a gas analyser controller to ensure production of a high purity gas.

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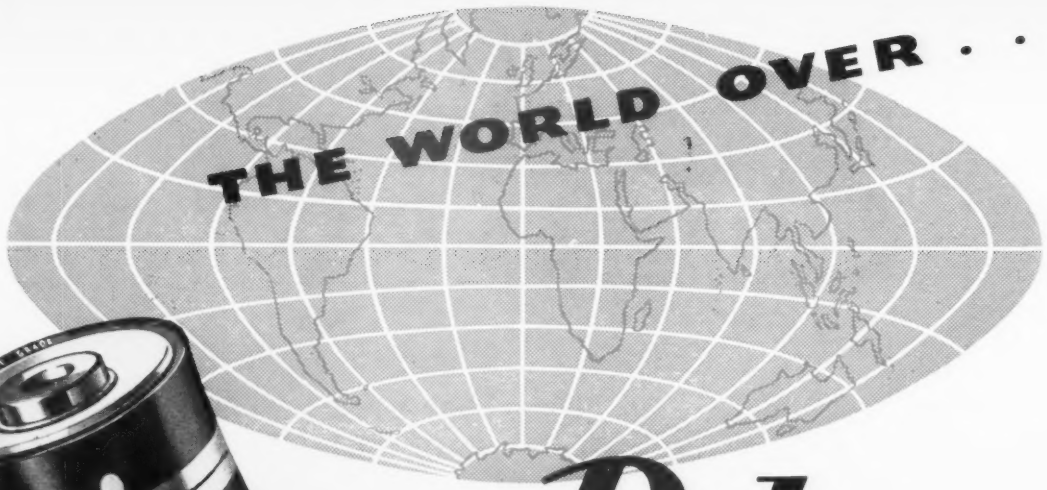

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V

CAMERON TYPE "F" GATE VALVES GIVE MORE SERVICE FOR LESS MONEY

THIS IS THE REASON –

Cameron Type "F" Gate Valves for API service have reduced operating cycle costs to the lowest of any valve in similar service.

HERE'S HOW –

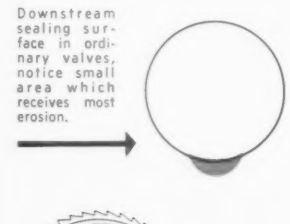
The rotating seat design found only in Cameron Type "F" Gate Valves exposes a new sealing pattern each time the valve is operated. Old design concepts are based on wedge fits to increase gate or plug contact pressure, viscous lubricants to bridge abrasions and reduce inherent friction, soft seals, or combinations of these conventional solutions to a tough problem. After extended tests and evaluation of every contemporary valve for API service, a summary revealed that all valves had one common characteristic. The down stream seat showed the most wear—maximum erosion always occurred in the same point—where pressure was first released in opening or where pressure was finally pinched off in closing.

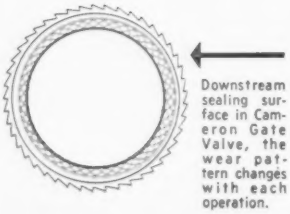
Then a new idea was conceived. Rotating the seat a fraction of a turn each time the valve was opened and closed would present a new surface at the critical point of greatest wear. This principle is the central feature of the Cameron Type "F" Gate Valve.

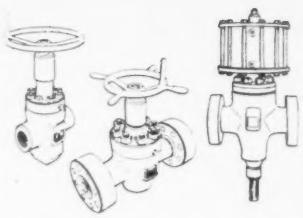
WHAT ABOUT COST?

All marketable valves when purchased must hold and release pressure. But purchase price does not represent total cost to use a valve. To purchase price must be added operating cost (continuous lubrication, frequent and difficult repair, slow operation) for the useable life of the valve. Divide this total by the number of times the valve is operated and you have a true picture of the original purchase. Actually you are buying operating cycles.

If you want the most operating cycles without maintenance—the lowest cost per cycle during the entire life of the valve no matter how tough the service, try Cameron Type "F" Gate Valves.







Cameron Gate Valves are available in sizes from 2 to 6 inches, and pressures to 15,000 psi, including manually or pressure operated models (hydraulic or pneumatic) for remote controls and automated circuits.

Cameron

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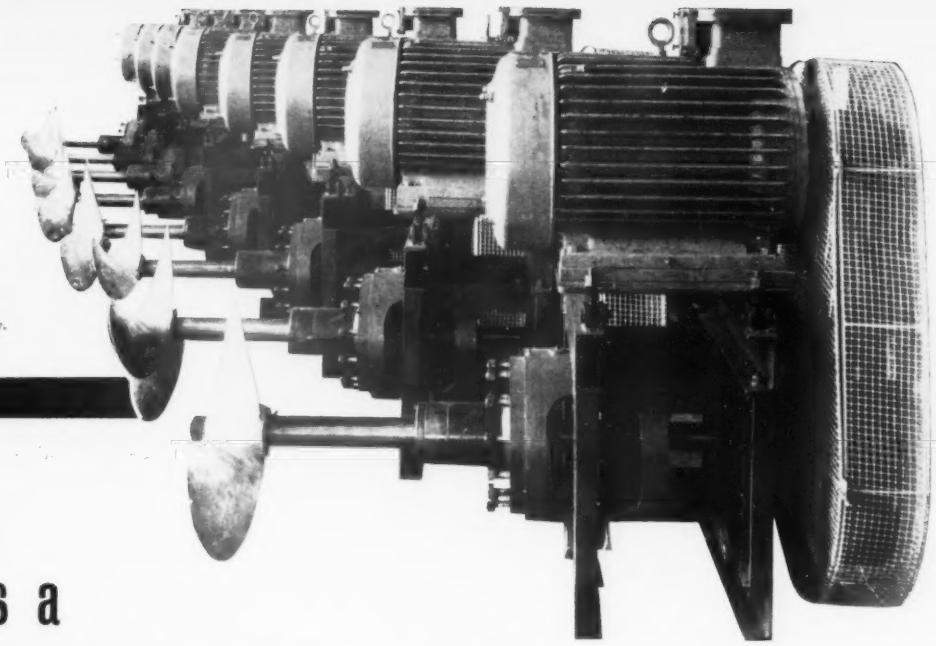
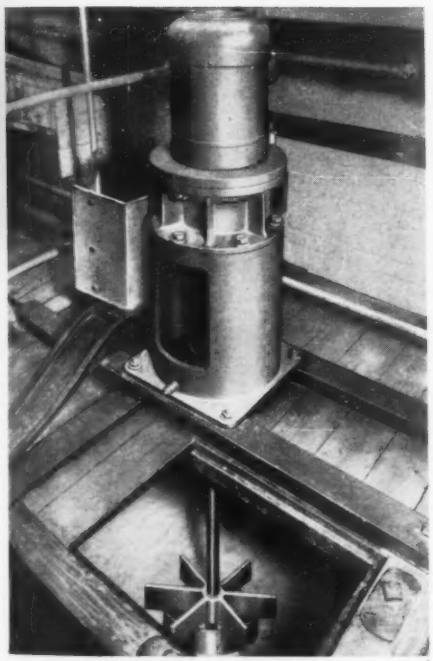


Battery of large Side-entry Petroleum blending agitators for despatch to a Middle East Refinery.

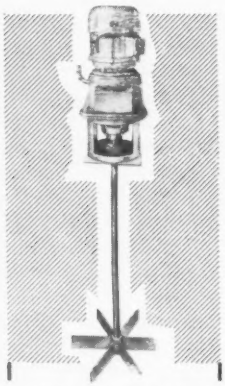
There's a MITCHELL MIXER

for every industrial need

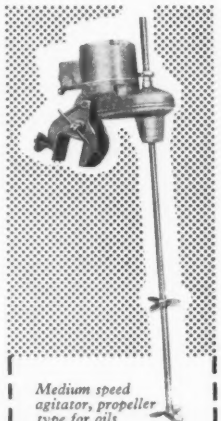
Whether your problem is oil blending, addition of additives, incorporation of the fats and greases, grease mixing or chemical mixing in reaction vessels on batch or continuous basis it will pay you to consult



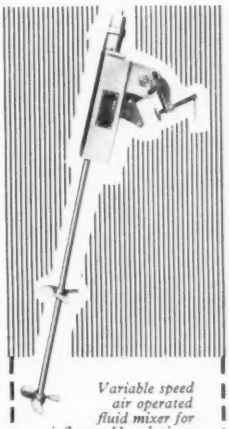
GVD type medium speed fluid mixer fitted with open type turbine impeller and stabiliser ring for oil and grease blending and for the inclusion of additives into lubricating oils.



Heavy duty 460 r.p.m. permanently mounted fluid mixer with turbine impeller.



Medium speed agitator, propeller type for oils and grease blending.



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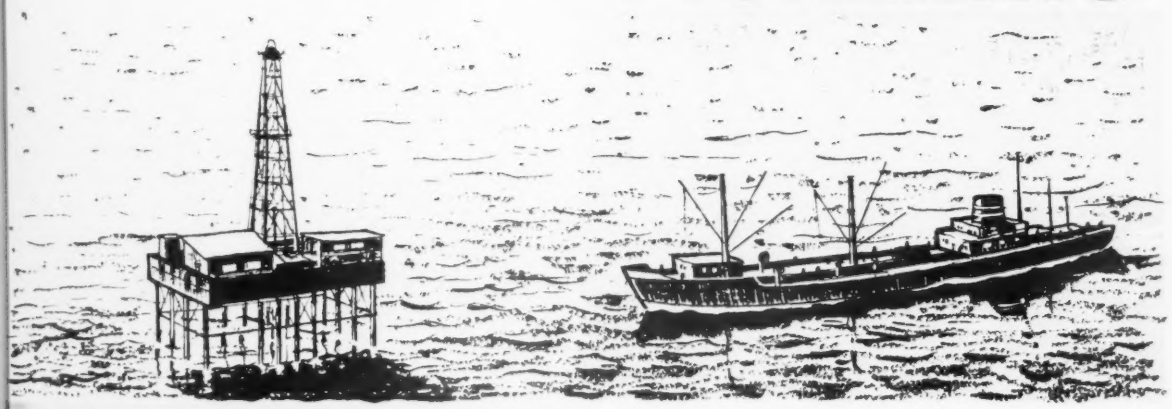

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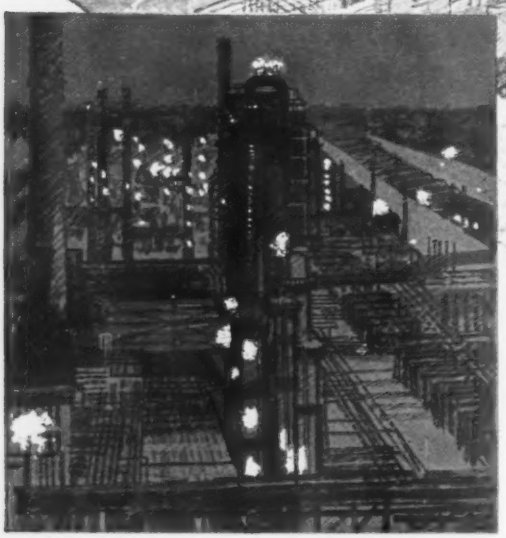

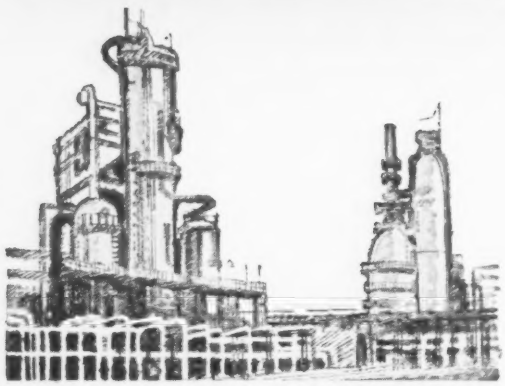

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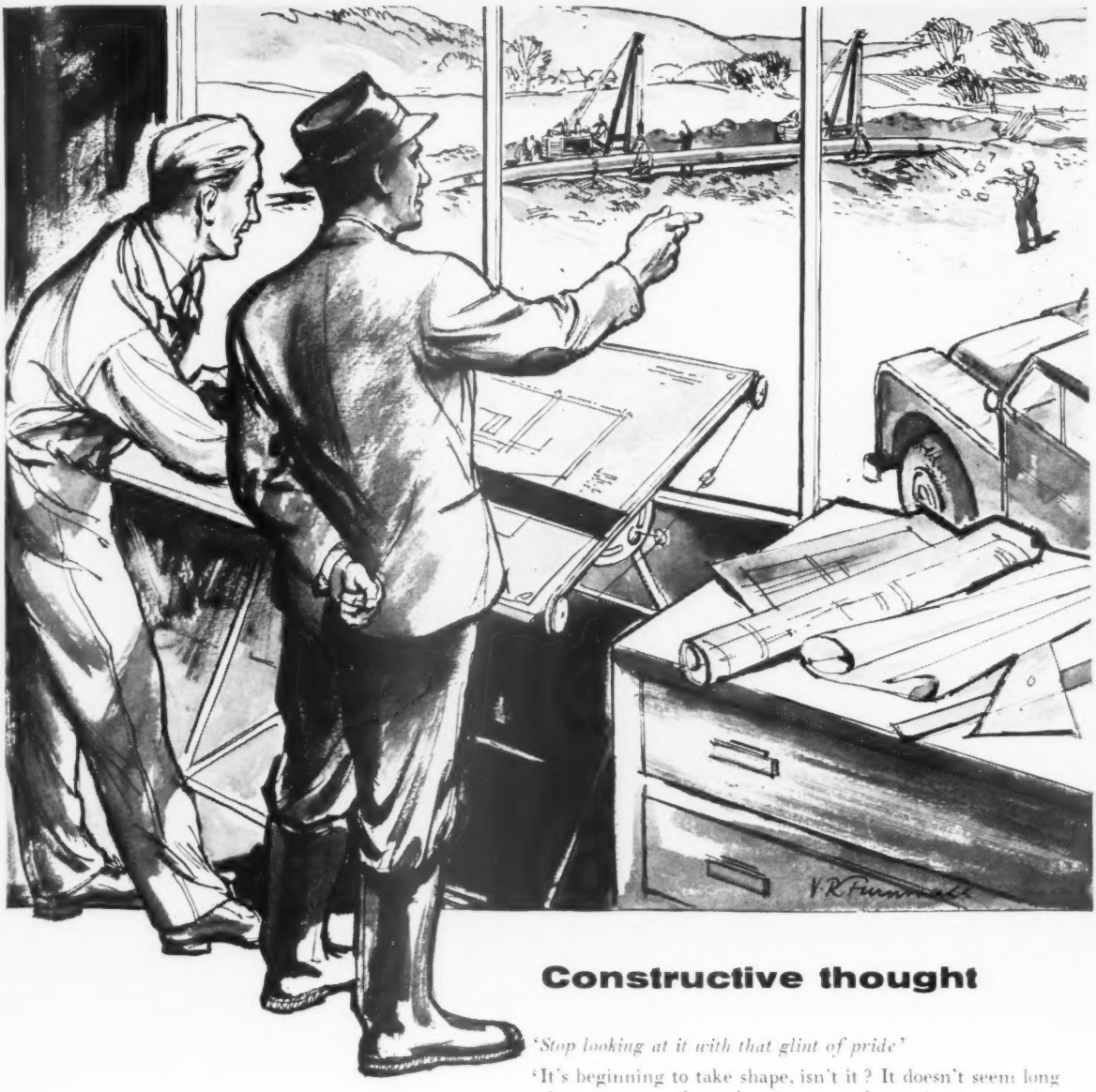

Constructive thought

'Stop looking at it with that glint of pride'

'It's beginning to take shape, isn't it? It doesn't seem long since we were just planning, yet the main construction work is under way already.'

'Resting on your laurels?'

'Haven't the time. We work in other fields too, you know — pipe fabrication and erection, civil and mechanical engineering, industrial plant erection. . . .'

'All right—so you've something to be proud of!'

'Of course we're proud of what we do. We're proud of our reputation, too.'

'And you mean to maintain it?'

'No. We mean to *improve* it. But now I'm just plain boasting. Drop you anywhere?'

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CROSBY Safety/Relief valves are chosen for

. PERFORMANCE
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Lower priced valves can be produced which will "do the job", but will their performance, reliability, adaptability and maintenance requirements keep operating and maintenance costs and shut-down time to an absolute minimum ?

CROSBY DESIGN – The Crosby JO & HS Full Nozzle, Full Lift Relief and Safety valves are the only valves having both easily adjusted, two ring control and truly flat seats on both disc and nozzle.

HIGH PERFORMANCE – Safety Relief valves rely on fluid kinetic forces just as much as static pressure for correct operation. Without an adjustable guide ring to vary the secondary orifice to suit different fluids the secondary orifice contours would have to be individually machined to suit each application for optimum performance and cannot be expected to be completely satisfactory on fluids other than that for which the valve was ordered.

WIDE ADAPTABILITY – The adjustment possible with the Crosby two ring control enables optimum performance of pop, lift, capacity, blowdown and shut-off to be readily obtained on all fluids, thus providing complete adaptability.

EASY MAINTENANCE – The perfectly flat seats on both nozzle and disc can very easily be resurfaced when necessary without the necessity of critical control of seat widths and angles; in fact the tools can easily be taken to the valve; it does not have to be taken to the tools.

The Crosby one-piece disc can be resurfaced many times without costly replacements. Also any dimensional changes due to resurfacing can easily be compensated for by ring adjustment, ensuring optimum performance.

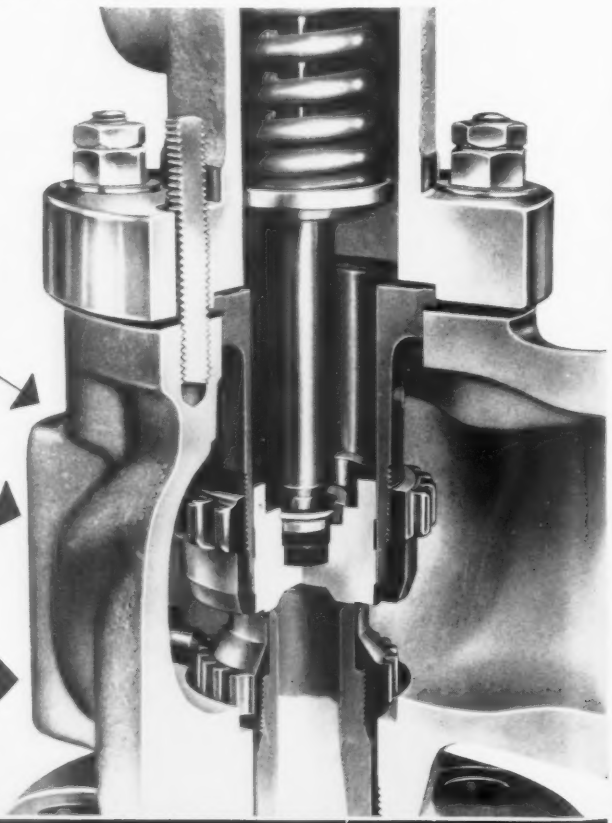
CROSBY

UNIQUE FEATURES

BLOWDOWN CONTROL
Guide ring accurately adjusts to required blowdown by changing the reactive forces of the various flowing media. Blowdown adjustment is independent of pop action.

FLAT SEATS
Both nozzle and disc seats are completely flat and easily resurfaced if necessary without replacement parts.

POP ACTION CONTROL
Adjustable nozzle ring assures sharp controlled pop action . . . prevents long drawn-out warn or simmer before popping.



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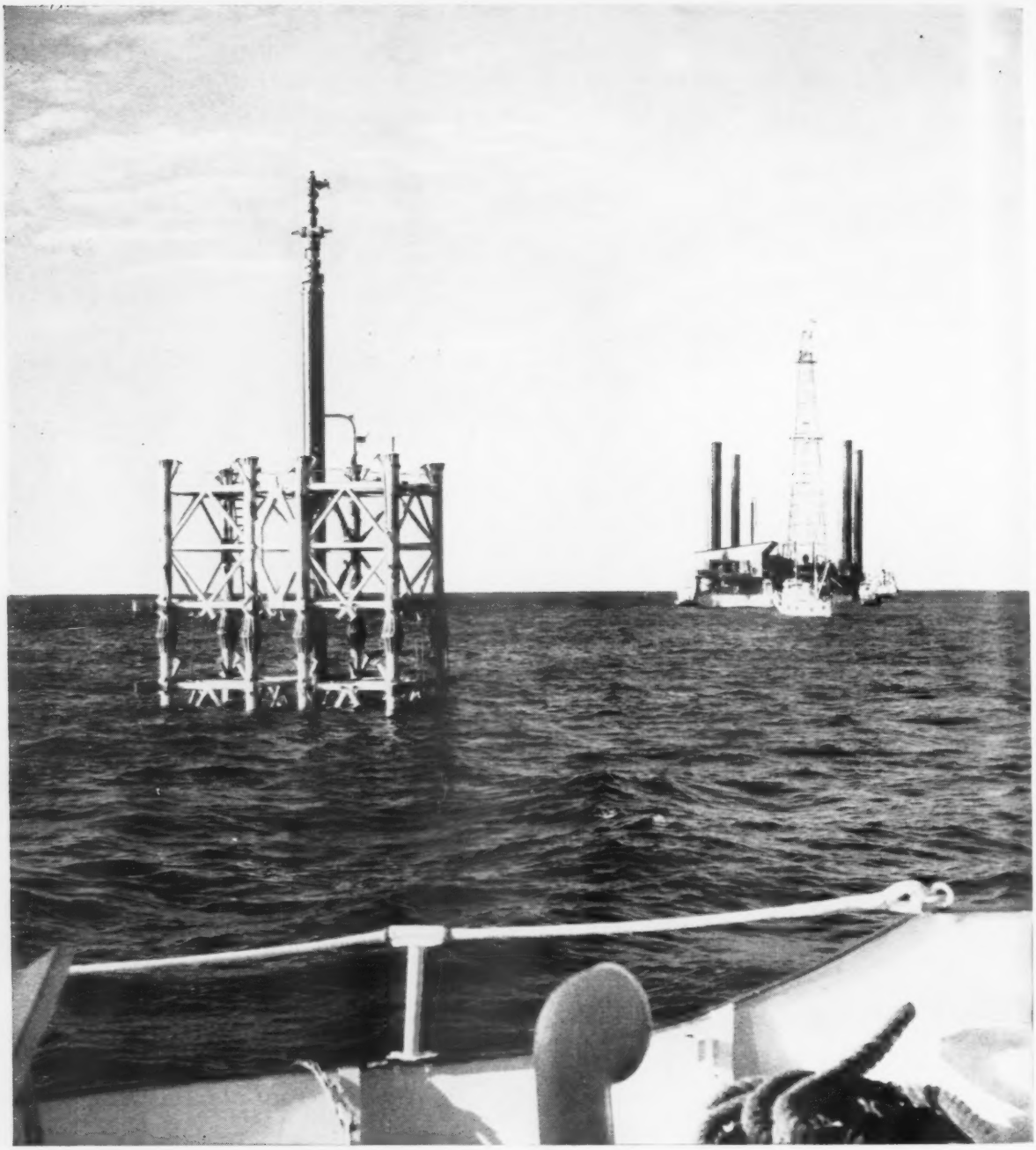


ABU DHABI

A well head in the Persian Gulf. In the background, the barge "Adma Enterprise" which is currently drilling beneath the waters of the Gulf. The results are sufficiently encouraging to warrant the preparation of facilities for regular production. This stage should be reached by mid-1962.

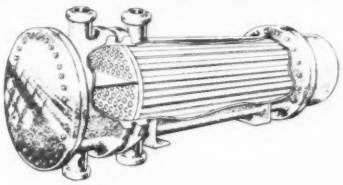
BP

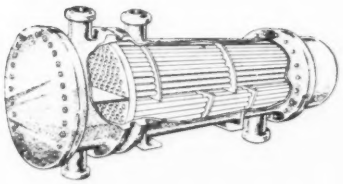
YORKSHIRE IMPERIAL

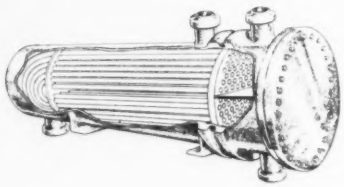
TUBES AND TUBE PLATES

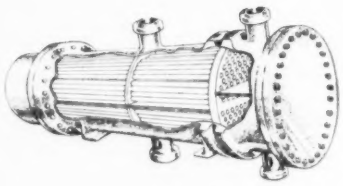
FOR THE PETROLEUM AND PETROCHEMICAL INDUSTRIES

Yorkshire Imperial have long been intimately associated with the Petroleum and Petrochemical Industries in all parts of the world and have made a careful study of the varied and often arduous operating conditions which obtain in these industries. This study has resulted in the development of improved tube and plate alloys, metallurgically designed and scientifically manufactured to give the best possible service, reliability, efficient operation and long life.









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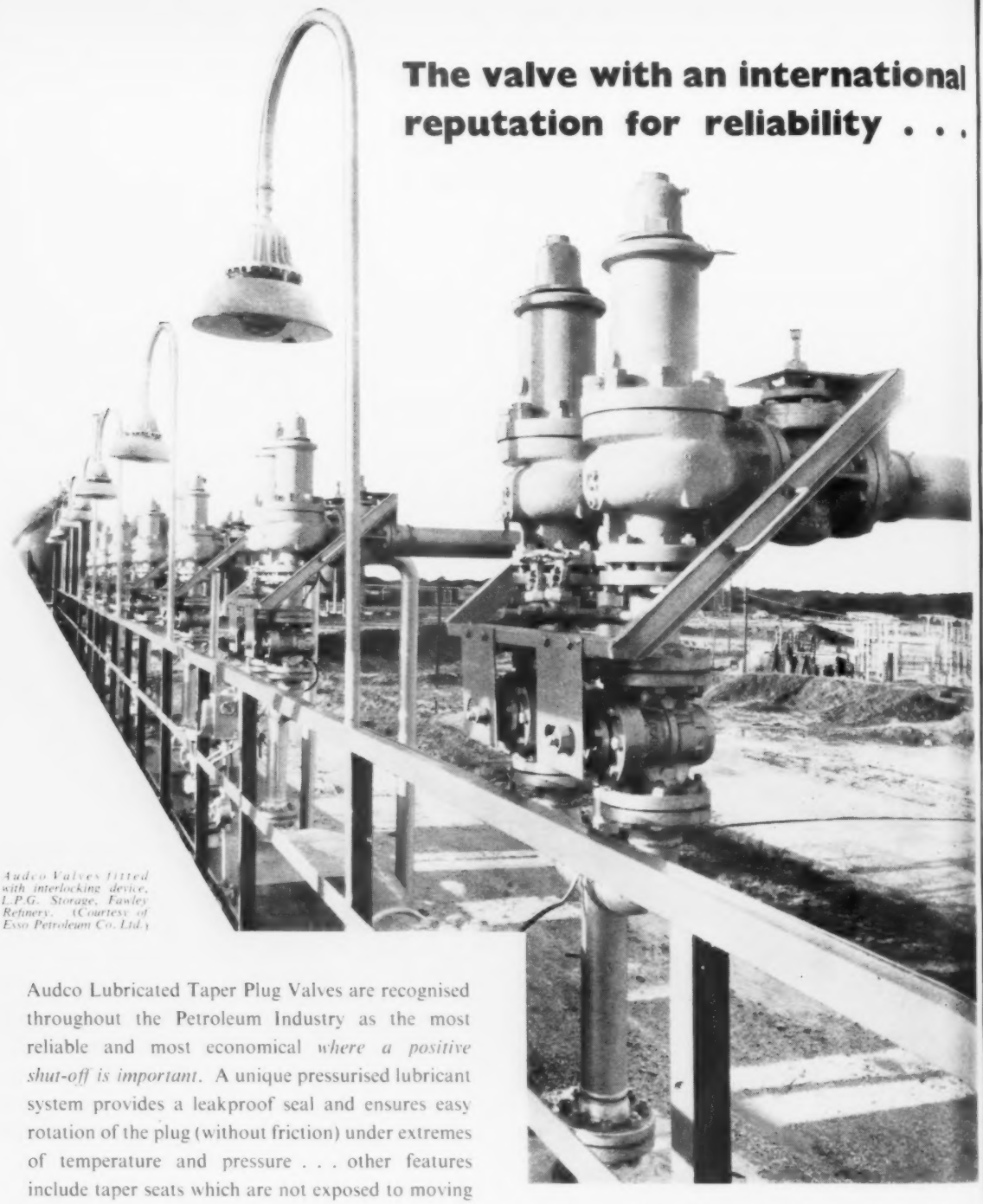

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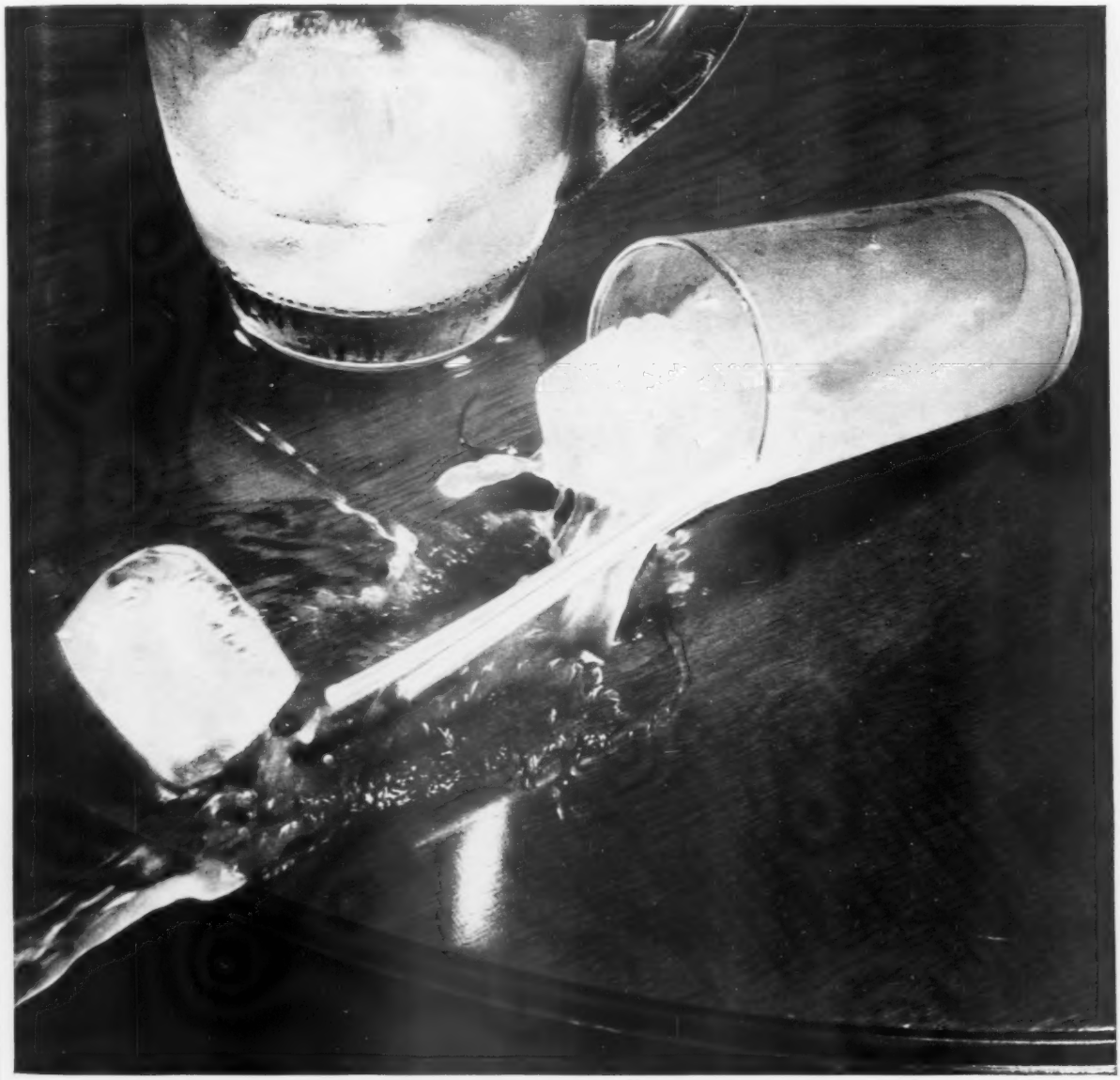

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THE INSTITUTE OF PETROLEUM
REVIEW

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*Review of the Year 1959**

By D. F. MITCHELL†

The year 1959 was possibly one of the most ordinary oil years on record. Admittedly it was the centenary year of Drake's Well, and it marked the end of a most stirring decade during which occurred the Abadan and Suez troubles, but this last year of the decade was free of crises. The customers' oil requirements were met in full without any strain, and there were no serious casualties among the many oil companies competing for a market which was less than their overall availability.

Demand increased by some 7 per cent, and as can be seen from Fig 1 the year fits neatly into the long-term trend of oil demand.

The graph shows that the demand during the decade was really very strong and stable, despite the crises and recessions that have taken place during that time. It is interesting to look back and notice the catastrophic effect of the great depression that began in 1929. During that period oil consumption in the U.S.A. fell by 20 per cent compared to a 6 per cent drop in the recent 1957-8 recession. It is perhaps worth noting here that coal production in Europe fell by 25 per cent then compared with a 6 per cent drop in recent times, although demand has fallen in recent years by 14 per cent. Whereas there was a very healthy increase in oil consumption, particularly outside the U.S.A., the position was not quite so happy for other forms of energy and especially for coal.

1959 saw considerable recovery from the recession which began in the United States in 1957 and which gradually spread throughout the world. Preliminary information is that world industrial production recovered by no less than 9 per cent in 1959, but energy demand only rose by 3 per cent and within this total the consumption of coal actually fell.

In Western Europe, although industrial production grew by 7 per cent, there was only a marginal increase in primary energy demand. It would be folly at this stage to try to analyse this curious situation and its implications, because the statistics are still very provisional, but there are one or two points to be made. The first is the most remarkable weather in Europe in 1959. It has been calculated that the warm winter and hot summer of 1959 probably enabled Europe to save something like 10-15 million tons of coal equivalent in fuel. This alone, however, does not explain the stagnant demand for energy. Other factors are due to the way consumers have been working their stocks and the improved efficiency in the use of energy, which was probably considerable—the saving in the switch to oil being one of the main reasons for this. The obvious example to quote of this is the use of diesel oil on the railways.

As foreshadowed by Dr Frankel in his Review of the Year 1958 (*Inst. Petrol. Rev.* 1959, **13**, 173) it is now very clear that there is no prospect of the Hartley forecast for OEEC energy consumption in 1960 being achieved, but as far as the oil forecast is concerned 1959 was ahead of the mean of Hartley's forecasts for 1960.

It is here that the first glimpse of what might be described as the 1959 crisis could be seen—that is the realization that coal demand in Europe was not recovering with the increased tempo of industrial activity, and a feature of the year was a distinct murmuring against oil with accusations of "dumping" and unfair competition.

In more responsible quarters it has been recognized that the solution to the coal industry's problem lies not in the protection of its market but in the rationalization of its operations to put it in a sound competitive position. It is refreshing to see the competitive spirit appearing in the British coal industry's current advertising campaigns. It is equally unfortunate to find Germany deciding to tax fuel

Oil Demand 1920–59 (*excl. U.S.S.R. etc.*)

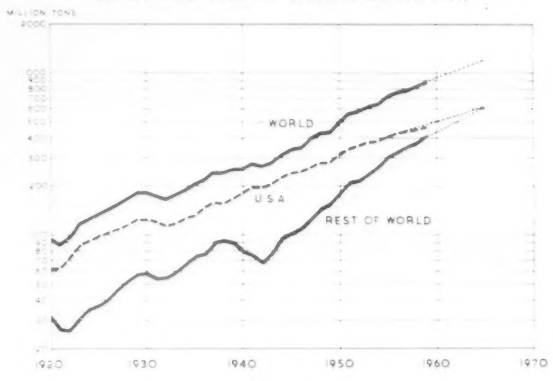


Fig 1

* Presented to the Economics and Operations Group on 7 April 1960.

† The British Petroleum Company Ltd.

European Product Demand 1950–9

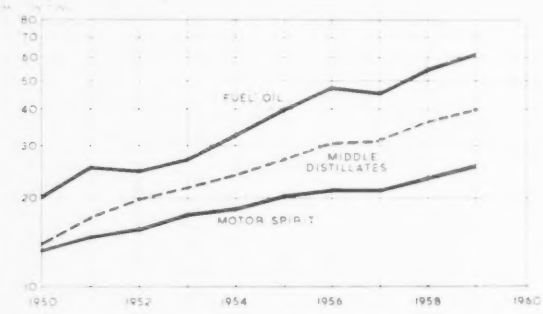


Fig 2

oil so drastically in order to alleviate the coal industry's position and it is to be hoped that this serious measure will prove to be only the temporary expedient it is proposed to be.

With regard to accusations of unfair practices in respect of oil prices, a familiar complaint is that fuel oil prices are often less than the price of crude oil. This is undoubtedly true in the U.S.A. and for the lighter Caribbean crudes, but not in the Persian Gulf, although there the differential narrowed during the year. But these are official prices—posted prices. There is undoubtedly to-day a lot of fuel oil selling in Europe well below the price of crude. There is a good deal of misunderstanding outside the industry on oil pricing matters, and many feel that the price of crude oil determines the price of the many products made from it—or ought to. Those in the oil industry know that this is not so. The prices of products produced from crude oil are determined by competitive factors in the different markets throughout the world in which they are sold, and it is these prices which ultimately determine the price that one can afford to pay for crude oil.

What are the implications of all this for the future? One answer was given in the recent report by the Robinson Energy Commission prepared for the OEEC. The most interesting aspect of the report is that a fresh estimate of future energy requirements gives figures which maintain Hartley's forecast for 1965, and an increased forecast for 1975, despite the fact that energy consumption in Europe in 1959 was still no higher than that of 1956.

The important conclusions of this new study are that there is no longer a prospective energy gap in Europe, and that Europe should be able to afford any energy imports it may need. The report emphasizes that the simplest and best policy for energy would be achieved by allowing normal economic forces to take their course. This is surely a most satisfactory report for the oil industry. It is difficult to judge what influence this report may have, and to what extent it may be accepted in the spirit in which it was written. Unfortunately, the current of dirigism in energy matters has recently been flowing more strongly again in the Common Market countries, inspired largely by France in her anxiety to ensure guaranteed outlets for the vast sources of oil and gas discovered in the Sahara. This of course is a substantial factor in the changed energy pattern brought out by the Robinson Commission.

With regard to natural gas, this has been achieving prominence throughout the year 1959 and has been associated, especially in Britain, with the apparently highly successful voyages of the *Methane Pioneer*. Natural gas continued to make a tremendous advance in the U.S.A. and also in Europe where, although the quantities were very small, there was a 40 per cent increase in consumption in 1959. Sales increased by 9 per cent in the U.S.A. compared with a static demand for distillate fuel oils.

A close investigation is now being made into the commercial possibilities of carrying natural gas across the sea, and the *Methane Pioneer* has certainly demonstrated the technical feasibility of the operation using a relatively small ship. The economics of this operation are a closely guarded secret and it may well be that these particular voyages have not contributed much on this vital aspect. The question of whether natural gas can be imported by sea, even from the nearer sources of supply, on a large enough scale and economically enough to compete with gas produced from the total gasification of oil remains a very open question.

U.S.A. Imports
April–December 1958 *and* 1959

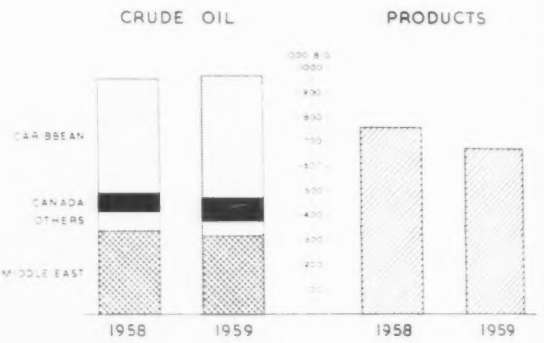


Fig 3

Studies are continuing on various ways of making the huge deposit of natural gas in the Sahara available to Europe. Some French experts believe that commercial-sized gas tankers could be in service by 1963. It would seem, however, that only by the development of pipeline transport could a major market for Saharan natural gas be opened up, although there are apparently immensely difficult problems in laying natural gas lines under the Mediterranean.

It can be seen in Fig 2 how demand for the three main products has developed in Europe over the last ten years, including 1959. It shows clearly the continuing and very rapid growth of fuel oil demand, especially in recent years. Middle distillates, and even gasoline, are also progressing well. The figures on the graph include bunkers—inland demand for fuel oil rose very much faster. This has put no strain on supplies despite a substantial additional increase in the demand for fuel oil in the U.S.A. and Canada in 1959.

Oil Supply

In retrospect, 1959 may well be remembered as the year when the full meaning of surplus oil supply became apparent. In the United States there had been surplus productive capacity for many years and indeed, it has been the government's policy to encourage this surplus for security reasons. The high cost of U.S. oil production, and the proration system, which forces refiners to use a proportion of crude other than their own, has made the U.S.A. vulnerable to competition from Middle East and Caribbean crudes for a number of years. Throughout this time, except in periods of crisis, there has been a conscious and continual attempt

to control oil imports, starting with industrial statesmanship, through voluntary controls, and finally in 1959 by means of mandatory control.

The effect has been to give every U.S. refiner, irrespective of his location, the legal right to some share of the profit on imported crude. It is now possible to see the effect of these controls in the U.S.A. and the imports for the period April-December 1959, that is, after the controls were imposed, are compared in Fig 3 with the same period in 1958.

Crude oil imports remained virtually constant during the year, but not the pattern of sources. The Caribbean gained at the expense of the Middle East. The import of products was substantially less last year than in 1958, and since most of these are of Caribbean origin the net effect was that the two major exporting areas suffered about equally. Fig 4 shows the effect of all this on U.S. crude oil production, covering the past four years for the period April-December in each case. Although output rose in 1959, it merely regained the 1956 level, and the two main producing states, Texas and California, actually had lower outputs. With every refiner now having a vested interest in import controls, and Texas production going down despite the restraint on imports, it would certainly seem that in the immediate future there is little chance of any significant relaxation of import controls.

One effect of a surplus situation is usually a development of the process of vertical integration by some form of combination of oil companies operating in different sectors of the industry. Crude producers seek control over refinery operations and refiners over marketing outlets. In 1959 a feature of the fairly tightly controlled oil economy of the U.S.A. has been the active intervention by the Department of Justice to prevent this process developing; some such combinations which made sound economic sense were either prevented from taking place or seriously modified. There has been a singular lack of developments in this respect in the world outside the U.S.A.

A major event in the oil life of Canada was the publication of the Borden Commission's Second Report. This was concerned almost wholly with the surplus crude oil productive capacity in Canada, and with the arguments for and against extending the pipeline system to the Montreal refinery complex which is currently processing nothing but imported crude.

The Commission gave a compromise recommendation suggesting that all areas accessible by pipeline to Canadian crude should be fed with Canadian crudes, failing which some form of government control might be expected. They rejected plans for government aid for a pipeline to Montreal. At the same time they set the oil companies a target for Canadian crude oil production equivalent to gaining the Montreal market. This high target can only be achieved by export, which virtually means export to the U.S.A. The production target set was a rate of 700,000 bd by the end of 1960. The current rate of production is 575,000 bd, and it seems quite unlikely that the Commission's target can be achieved by the end of this year. Although during 1959 the U.S. import regulations were altered to free from quotas Canadian imports by pipeline, judging by recent remarks attributed to Captain Carson, the U.S. director of oil import quotas, no great assistance is going to be forthcoming from south of the border!

U.S.A. Crude Oil Production
April–December 1956–9

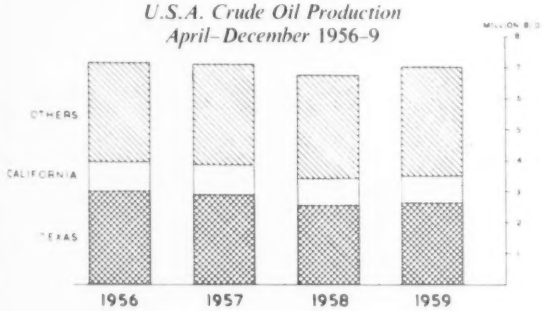


Fig 4

1959 saw the opening of the first pipeline from the Sahara, and a major new production area is now competing for markets. Perhaps competing is hardly the right word since the French authorities have made it abundantly clear that they favour a system whereby Saharan oil is provided with a guaranteed and protected market, not only in France, but in the Common Market as a whole. The outcome cannot be foreseen, but the magnitude of the problem may not be as large as was once thought, judging by recent industry—as opposed to political—assessments of the potential of discoveries to date. On the other hand, some very promising finds have been made in Libya, and there is every reason to expect a substantial and increasing flow of oil from North Africa in the next few years.

Another factor adding to the world surplus situation has been the considerable increase in supplies to the free world from Russia. These supplies, by the inevitable process of marketing in close co-operation with governments, have a certain amount of protection. It is worthy of note that the additional Russian exports to Europe last year were equal to one third of the total increase in European oil demand. Another aspect of these exports which is worth noting is that the products, which represent 60 per cent of the total, are very largely gas, diesel, and fuel oils.

Some notable discoveries and developments have taken place in other countries, mostly where governments had already well-established machinery to ensure the absorption of the supplies in the local markets. Argentina, India, and Egypt are examples. Argentina would appear to be rapidly heading for self-sufficiency in crude oil and this, it should be noted, is due to close co-operation with private enterprise in the search for and development of oil. It may be wondered whether this dramatic change in her fortunes provides an object lesson for her large northern neighbour.

Another important event on the theme of government or state action was the successful Arab League Oil Conference held in Cairo last April. Although there were notable absences this may well be remembered as the first occasion on which the representatives of governments and operating companies met together to discuss in practical terms their respective problems. It is not easy to see how far such co-operation can be extended in view of the many conflicting interests in the whole wide range of the oil industry, which is daily becoming more and more complex, but it would appear that some sort of regional understanding may be beginning to emerge.

It is not easy to assess the extent of surplus refinery capacity, for such data is purely nominal. The published statistics show only a small increase in world capacity in 1959. On this evidence the surplus actually decreased in 1959! On the other hand, there was an outcrop of plans and negotiations for building new refineries in many markets hitherto served from refineries in the main exporting areas. Many of these projects are actively supported, if not directly sponsored, by

Governments. They will almost certainly lead to an increasing statistical surplus of capacity.

Tankers

Perhaps the most significant feature of the tanker year was the rapid increase in scrapping in the second half compared with the first half. But this step was not enough to bring supply and demand anywhere near in balance. Inevitably the placing of new orders was at a much reduced level, and the world's order book fell from 25.6 million tons dw at the beginning of the year to 19.5 million tons at the end, *i.e.* by a quarter. Flag discrimination seems to be on the increase: in the U.S.A. a determined attempt is being made by independent owners to get the rules altered to require importers to carry 50 per cent of their needs in U.S. flag tankers.

General Summary

A situation of surplus always has a depressing effect for those who are supplying goods, and it would be wrong to conclude with this rather dismal picture without trying to put it into some perspective.

In the first place there is nothing dismal about the demand for oil, and 1959 has in no way given any reason to make a drastic revision to estimates of the future.

It appears that the forces that determine oil demand are still working in much the same direction as they have been doing for some time, and there seems to be a reasonable consensus of opinion on how the future might develop. A forecast made in 1956 by the Chase Manhattan Bank is superimposed in Fig 5 on the demand trends shown in Fig 1, and it appears that the estimate is working out pretty well. A closer look would point to a lower actual consumption in the U.S.A. and a higher figure in the rest of the world.

Adapting these forecasts slightly to allow for these variations, it can be seen in Fig 6 how the total cumulative oil requirements over the next six years, that is up to 1965, might be met. The diagram also shows cumulative production from main sources for the past 12 years, divided into two periods of six years each.

There are no numbers on the diagram, for it is a picture, not a precise forecast. The areas are proportional to quantities, and the diagram is designed to show the share of supply which each main area may achieve. In building up the possible future supply allowance has been made for maintenance of the U.S. import controls to give imports a constant share of demand. Allowances have been made for the development of Canadian, Saharan, and Libyan oil, and for growing exports from Russia.

Oil Demand 1920–59 *and Forecast* 1965
(excl. U.S.S.R. etc.)

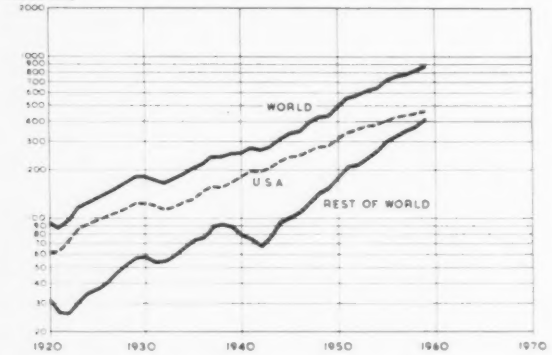


Fig 5

Cumulative Crude Oil Production

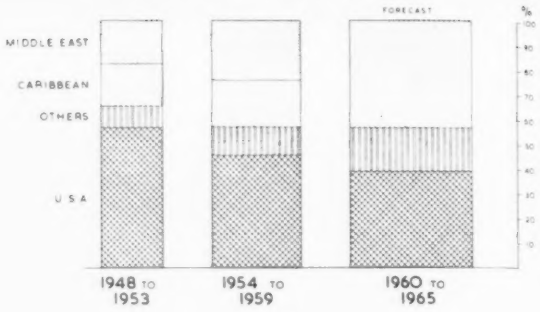


Fig 6

The diagram shows that in the past six years there has been a substantial increase in the share of world demand met by the Caribbean and Middle East, especially the Middle East. Looking ahead, it would seem that these major exporting areas will hold their share and produce in the process some 40 per cent more oil than in the past six years. The reason for the U.S.A. losing ground proportionately is because production has been taken at a constant share of demand, but demand in the U.S.A. is expected to grow at a slower rate than elsewhere.

Bearing in mind that much of the increase in the production shown as "others" will involve little or no tanker effort, and that the restriction in the rate of growth in imports into the U.S.A. will have some effect on the long haul deliveries from the Middle East to the U.S.A. it is probable that, during the next six years, the demand for tankers may not be as buoyant as over the past decade. Nevertheless, much more tanker tonnage will be needed than is being used to-day.

This diagram is simply one possible pattern that might emerge from the many interesting and exciting events that will reflect the intensely competitive situation over the next few years and of which 1959 provides a glimpse.

DISCUSSION

Dr P. H. Frankel opened the discussion and took up three points raised by Mr Mitchell in his paper. He agreed that forecasting was a difficult and dangerous process but a necessary one. Thorough research had to be done before estimates were arrived at, and even then they should always be regarded with a critical eye.

Secondly, he felt to be mistaken the frequently repeated argument that fuel oil sold below the price of crude was being "dumped". Oil product prices were determined by market demand and competition in the market. These conditions meant that petrol could be sold at prices above that of crude oil and it could therefore be maintained that there was no reason why fuel oil should not be sold below the price of crude oil. Similarly the price of crude oil was determined by the level of product prices in the market with a floor to its price set by production costs.

Finally, Dr Frankel referred to the development of natural gas markets. Natural gas, economically transported, competed with oil because of the low value set upon it at source in relation to that of crude oil. Were oil to be similary valued, gas could not compete in markets distant from the source of production. As it was, natural gas competition was significant for the oil industry and might well reduce the value of investment in the industry.

M. E. Hubbard agreed that natural gas, not fuel oil, was the real by-product of the oil industry, a by-product which could

well upset the oil industry itself. On the likelihood of Saharan gas reaching Europe, he felt certain that the technical problems of piping the gas across the Mediterranean would be solved, but on the economics of such a venture he reserved judgment.

Mr Mitchell agreed with Mr Rees Jenkins that quality improvement had continued in 1959 but not significantly, although quality competition seemed to be descending further down the barrel.

In replying to W. L. Newton, who felt that future Russian competition would be effected by government controls, increased crude supplies elsewhere, and changes in the current tanker freight position, Mr Mitchell expressed his belief that Russian exports would be of growing significance in view of their pipeline developments, the likelihood of low freights for some years to come, and the possible entry of Russian exports into countries little effected at present.

When C. P. Dalton said he believed the main effect of Russian competition would be upon the established price structure, Mr Parsons suggested that this might lead to an extension of oil's market at the expense of coal. Mr Dalton considered this might well lead to a hardening in the attitude of governments, rendering the task of western oil companies even more difficult. The fact that the Russians could offer low sulphur fuel oil, H. E. Barry said, might well tempt major companies to obtain supplies from them.

Mr Mitchell agreed with D. E. Miller that the failure of the Free Trade Area and Common Market countries to come to any arrangement was unfortunate but he felt that the direct effect for the oil industry would not be important. The setting up of a Common Market had been welcomed by the industry as a whole although certain traditional exporters might be adversely effected if special protection was afforded North African oil and gas production. The outcome of this issue was still in some doubt.

In answer to Mr Page, Mr Mitchell said that as yet the facts were not available to verify the reasonable assumption that the efficiency with which energy was used in Europe had increased in 1959. H. E. Barry suggested that there was evidence that in the U.K. up to 4 million tons of the 10 million ton drop in coal consumption in 1959 had been the result of such increases in efficiency. Equally important in the decline in fuel consumption, however, had been the mildness of the weather and the steady switch of emphasis from intensive heavy industry to lighter industries. C. P. Dalton mentioned as further significant factors the introduction of new processes in the steel industry and dieselization on both road and rail.

G. Chandler considered the really significant development in 1959 had been the emergence of a fully competitive energy market in Europe, as in the U.S.A. Governments were now confronted with the choices of free trade or self-sufficiency, of free competition and consumer choice or restrictive energy policies. Mr Chandler closed the discussion by warmly thanking Mr Mitchell for his paper.

* * *

Petroleum Institute of France in Australia

The Australian Minister for National Development, Senator W. H. Spooner, M.M., recently announced that the Commonwealth Government had decided to engage the Petroleum Institute of France to make a review of petroleum possibilities in Australia. The review would be made in two stages. The first stage would consist of a general survey of the Australian sedimentary basins; the second of a more detailed examination of selected areas.

Mr Spooner made the following statement:

"The making of a review of the kind proposed has been an objective of the Bureau of Mineral Resources for many years. Indeed the Bureau has made some progress with this review, but it has been apparent for some time past that, because of the continually increasing demands on the Bureau, some unusual action would need to be taken if the review was to be completed in a reasonable time. Recruitment of an adequate number of experienced scientific officers for the purpose would have been virtually impossible. Moreover, it is considered that there are considerable advantages to be gained by employing such an experienced and successful organization as the Petroleum Institute of France.

"The Institute has been in existence for about sixteen years. It is an unusual organization not only because it is concerned with all aspects of petroleum from exploration to refining, but because it has three distinct functions—to teach, to do research, and to undertake investigations on a contract basis. An added attraction from our point of view is that the Institute is advisory, not executive, and that it has no commercial interest in oilfield development.

"It has had some striking successes in its petroleum investigations. These investigations are of two kinds. The first consists of a review of the petroleum geology of areas where a considerable amount of geological information has accumulated and where drilling has been done. The Institute describes this kind of investigation as synthesis. The second kind of investigation consists of the reconnaissance of sedimentary basins on which only limited information is available and where little drilling has been done.

"The French body has made syntheses in Tunisia, in the French African Territories of Madagascar and Gabon; and within France, in Aquitaine, Savoy, Bresse, and Jura. The results obtained in Gabon illustrate the contribution which can be made by reinterpretation and synthesis. The operating company, acting on the advice of the Institute, completely re-orientated its prospecting with considerable success. There are now four oilfields in the Territory which in December 1959, were producing at the rate of 15,000 bd.

"The Institute has made reconnaissance investigations of the Paris Basin, The Limagne, the Rhone Corridor, and the Sahara. It states that before the completion of its report on the Paris Basin the prospects of the Basin for oil were regarded as negligible. It reached a different conclusion. It did not assess the possibilities as of the first order, but considered there a real chance of success. There are now three producing oilfields in the Basin and prospecting operations cover virtually the whole of it.

"Concerning the southern Sahara the Institute state—We were able to establish the possibility of accumulation in the Palaeozoic. Above all, we were able to show that the strip north of the Hoggar, until then officially condemned, possessed on the contrary, possibilities which the accumulations of gas and oil discovered by CREPS have fully confirmed. We were able to show, before the commencement of prospecting, that it was in areas so far neglected that prospecting should be undertaken."

"The Institute will work in the closest collaboration with the Bureau of Mineral Resources and, in individual States, with the officers of the Mines Departments. As its work develops, I hope also that all exploration companies will be prepared to make information available to the Institute's scientists and to enter into discussions with them. The Government believes that the Institute has something novel to contribute to oil exploration and that its engagement cannot fail to have a stimulating influence on the search for oil in Australia.

"A mission, headed by Dr Trumpy, the Director of its Bureau of Geological Studies, will arrive in Australia shortly and will thereafter be engaged continuously for some months on the first stage of its assignment."

Personal Notes

Sir Neville Gass, chairman of The British Petroleum Company, is relinquishing his appointment on 30 June having reached normal retirement age.

Sir Neville Gass

The **Hon. Maurice Richard Bridgeman,** C.B.E., has been appointed to succeed Sir Neville Gass.

Mr Bridgeman was born in 1904, the third son of the first Viscount Bridgeman. Educated at Eton and Trinity College, Cambridge, he joined the Anglo-Persian Oil Company in 1926. After two years' service in Persia, he worked in the London office until the second world war, except for 1934-7 when he was in charge of the Company's New York office.

In 1939 he was petroleum adviser to the Ministry of Economic Warfare, becoming assistant secretary of the Petroleum Department and joint secretary of the Oil Control Board in 1940. In 1942 he was temporarily loaned as petroleum adviser to the Government of India. From 1944 to 1946, when he rejoined the Anglo-Iranian Oil Company, he was principal assistant secretary of the Petroleum Division of the Ministry of Fuel and Power. In 1952 he became managing director of the D'Arcy Exploration Company and was appointed to the board of BP in April 1956, as a managing director, becoming a deputy chairman in July 1957.

He was created a Commander of the Order of the British Empire in 1946.

Hon. M. R. Bridgeman

John Mellor Pattinson, C.B.E., B.A., F.Inst. Pet., has been appointed a deputy chairman of The British Petroleum Company Ltd with effect from 1 July 1960.

J. M. Pattinson

Mr Pattinson was born in 1899 and educated at Rugby, at Cambridge, where he graduated in engineering, and the Royal Military Academy, Woolwich. After war service in the Royal Field Artillery he joined the Anglo-Persian Oil Company in 1922 and served in Iran until 1945.

From 1937 to 1945 he was general manager in Iran, and was made a C.B.E. in 1943. He returned to London in 1945, and was appointed a managing director in 1952.

M. A. L. Banks

M. A. L. Banks, B.Sc., F.R.I.C., M.I.Chem. E., F.Inst. Pet., has been appointed to the vacancy on the board. He joined the Anglo-Persian Oil Co in 1924, and after six years at Llandarcy refinery served in Persia from 1930-3. In 1952 he became deputy general manager, Refineries and Technical Department, and in 1957 general manager. He became a director of BP Trading Ltd in 1958.

N. L. Falcon, chief geologist of BP Exploration Company since 1952, has been elected a Fellow of the Royal Society.

Mr Falcon joined BP's geological staff in 1927, and was working in Persia until 1936, being resident geologist at Gach Saran when the field was discovered. In 1937 and 1938 he was resident geologist for the exploration drilling programme in Scotland, and after war service, from 1945 to 1952, was employed as assistant to the chief geologist in head office, with special responsibilities for U.K. exploration and photo-geological work. In 1952 Mr Falcon received the Murchison Fund Award from the Geological Society of London.

The Council of the City and Guilds of London Institute has conferred one of its special annual awards, for 1960, on **Sir Leonard Sinclair,** M.Inst. Pet., who was for many years chairman of Esso Petroleum Company Ltd.

E. F. Choppen, M.Inst. Pet., has resigned from the board of Esso Petroleum Company following his appointment as deputy co-ordinator of the world-wide marketing operations of Standard Oil Company (New Jersey). He will leave London for New York shortly to take up his new duties.

E. F. Choppen

Aged 49, Mr Choppen joined Esso Petroleum Company as a chemist in their Technical Sales Department in 1930. He was appointed assistant general sales manager at head office in 1953, and became manager of the Company's Co-ordination and Economics Department early in 1957. He was appointed a director in 1959.

We regret to announce the death of **Victor Blagden,** ex-chairman and founder of Victor Blagden & Co. Ltd, on 31 March, in his 93rd year. He was the first chairman of the British Chemical & Dyestuffs Traders' Association, and was for 27 years the president of the Association. He relinquished the latter office in 1949, and in the same year retired from the board of his company.

The American Independent Oil Company Inc has announced the election of the following officers: **Eugene E. Dawson**, vice-president and general manager, **J. O. Cumberland**, vice-president-treasurer, and **Robert A. Bussian**, secretary. Mr Dawson is a graduate of the Colorado School of Mines, with a degree in petroleum engineering. Prior to joining American Independent as general manager of the Company's operations in the Kuwait-Saudi Arabia Neutral Zone in August 1959, he was assistant resident manager for Esso Standard (Turkey) Inc.

Mr Cumberland is a graduate of the University of Michigan, and before joining the Company in May 1959 as secretary-treasurer, he was associated with Aramco for eleven years in the capacity of assistant treasurer in Europe, at The Hague, and later in Dhahran, Saudi Arabia.

Mr Bussian, who is the Company's attorney, is a graduate of the Law Schools of the University of Colorado and New York University. He was formerly associated with Malco Refineries in Roswell, New Mexico, as attorney, and joined American Independent in June 1959.

We note with regret the death at the age of 65 of **Bertram Baden**, M.C., M.I.H.V.E., chairman and joint managing director of Matthew Hall & Co. Ltd.

Mr Baden joined Matthew Hall in 1922 when it was a small concern, and in 1932 was made a director. He became chairman and joint managing director in 1936 and retained these appointments after the Company was made a public company in 1938, until his death.

G. F. Hazzard, B.Sc., A.R.C.S., F.Inst.Pet., has retired from the Royal Dutch/Shell Group, and taken up the appointment of senior scientific officer in charge of the Petroleum Section of the Defence Standards Laboratories, Department of Supply, Australia.

G. E. Mash has been appointed manager, Dealer Trade Department, of Petrofina (Gt Britain) Ltd.

Mr Mash, who has been over 30 years in the petroleum industry, was previously in South East Region, as Dealer Trade Supervisor, and came to head office in 1958 as assistant manager, Motor Fuel Department.

A. C. Ball, B.Sc., (Eng.)., A.C.G.I., and **A. E. Gilbert**, F.C.W.A., have been appointed directors of Hayward Tyler, a member of the Stone-Platt Industries Group.

Mr Ball has held the post of production manager for some years, and Mr Gilbert that of commercial manager and chief accountant.

G. F. Ashford has been appointed deputy chairman of the Chemical Group, The Distillers Company Ltd. **J. M. Rimington**, managing director of the Chemical Division, has retired for reasons of health after 30 years' service, and has been succeeded by **J. H. Dunn**. **J. S. Hunter** will succeed Mr Dunn as assistant managing director (commercial) of the Chemical Division.

Holman Brothers Ltd has appointed **Peter M. McKay** to a new senior technical sales post to represent the Holman Group of Companies in connexion with the oil industry.

Mr McKay was previously technical representative for the Essex and East London area. Prior to joining the Group 6½ years ago he was engaged in chemical and machinery sales activities.

George Kent Ltd announces the appointment to the board of directors of **John F. Willsher**, general works manager.

Mr Willsher joined the Company in 1947 and four years later was appointed production controller and, in the following year, production manager. He held the post of instrument division manager from 1955 until early 1959, when he became general works manager.

J. F. Willsher

J. Howlett, B.Sc., F.R.I.C., M.I.Chem.E., general manager of the Hull site of The Distillers Company Ltd, has been appointed a division director of the Chemical Division of DCL.

Mr Howlett has been with the Company for 36 years, beginning with analytical work at the Research Station, and was transferred to the Research and Development Department in 1927. From later in that year until 1929, he worked successively at the Kings Lynn solvents factory, and at the Bankhall and Hammersmith distilleries.

His association with the Hull factory began in 1929 when the plant constructed at Salt End by British Industrial Solvents started operation. He came to Salt End as section chemist and was later a process superintendent in charge of pilot plant.

In 1941 he was transferred to the pilot plant at Tonbridge, of which he was appointed manager in 1945, and in 1954 he returned to Hull as works manager.

F. R. Brown

It has been announced by William Press & Son Ltd that **F. R. Brown** has been appointed manager of the Personnel, Welfare, and Training Division of the Press Group of Companies.

Mr Brown is a well-known figure in the cricketing world. During 1958–59 he was manager of the MCC team touring Australia and New Zealand.

* * *

MOTOR SPORT IN 1959

Castrol's 48-page Achievements Book for 1959 presents a kaleidoscope of a year's motor sport. The book contains a hundred photographs, and many facts and figures about races, rallies, records, trials, and scrambles throughout the world.

A catalogue of events in all types of motor sport, from outboard motorboat records to the Monte Carlo Rally, is given.

Achievements 1959 is obtainable free of charge from C. C. Wakefield & Co. Ltd, Castrol House, Marylebone Road, London, N.W.1.

Symposia at IP Branches

OLEFINS, FUEL OIL, AND INDUSTRIAL WASTE

The period 24 March to 2 April was the high season for the holding of symposia by Branches of the Institute. The first of these meetings was held in the University of Manchester, when our Northern Branch, in conjunction with the local organizations of the Chemical Society, The Royal Institute of Chemistry, and The Society of Chemical Industry, held an all-day symposium of "The Industrial Chemistry of the Lower Olefins". A week later the Yorkshire Branch, meeting in the Houldsworth School of Applied Science, Leeds, spent the afternoon discussing theoretical and practical aspects of the use of fuel oil. Finally, on 2 April, which incidentally was a Saturday, the Fawley Branch and the Mid-Southern Counties Section of The Royal Institute of Chemistry joined in an all-day consideration of the disposal of industrial wastes.

All were equally successful in attracting substantial audiences and initiating discussions on topics of obvious interest. It is hoped that most of the papers presented to these meetings will be reproduced in either the *Journal* of the Institute or in the *IP Review*. It is proposed, therefore, to deal here only broadly with the three meetings.

OLEFIN CHEMISTRY

A total of about 200 attended this three-session symposium on the lower olefins. The first session was presided over by Professor Frank Morton, who said that this was the usual annual symposium of the four bodies concerned. It was the turn of the Northern Branch of the Institute of Petroleum to organize the meeting. It was intended to present an up-to-date picture of industry's thoughts on the lower olefins, and this would be of particular value to all interested in the utilization of olefins. The Institute was especially grateful to the various authors for their contributions.

Ethylene Production

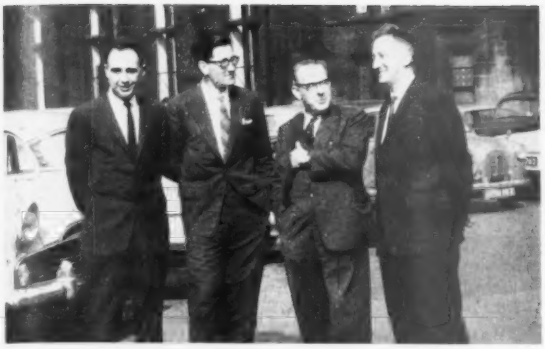
First paper in the first session was by J. Chrones and J. L. James (*Kellogg International Corporation*) on "Economies of Ethylene Production from Light Naphtha".

Because of its availability and price, light naphtha will remain a favoured feedstock for ethylene production, particularly in those regions where there is no natural gas. Thus, ethylene is likely to remain the principal "building block" of the chemicals from petroleum industry in Britain. Even in the United States, light naphtha can be justified as a long-term feedstock for ethylene production. With a boiling range of approximately 40 —90 C, it is available at relatively low cost.

The main economic factors of ethylene production from light naphtha are product distribution, plant size, and value of fuel, feed, and by-products. Three types of unit were considered, each of the same annual capacity of polymerization-grade ethylene, the ethylene: by-products yield ratio being respectively high, intermediate, and low.

Cost of feedstock and credit for by-products are the biggest factors affecting the economics of ethylene manufacture from light naphtha. High severity pyrolysis, with recycle of ethane product to pyrolysis to minimize feed consumption, is preferable under conditions of high feed costs and low by-product values. On the other hand, when feed cost is low and by-product values high, lower severity operation without ethane recycle would be preferred. By-product valuation will vary considerably according to local and other conditions, but at present the ethylene market is considerably greater than for the other by-products as sources of petroleum

Speakers at the Manchester Symposium. (Left to right) *J. Chrones, R. P. van Oosten, A. F. Millidge, A. A. Appleton, and Professor C. E. H. Bawn.*



Authors and chairman of the morning session at Manchester during the luncheon break. J. Chrones, J. L. James, F. Morton, and R. P. van Oosten.

chemicals. Thus, a high ratio of propylene to ethylene cannot be justified simply on the basis of its potential for polypropylene. There is sufficient propylene by-product from the high-severity operation to satisfy even the expanding requirement.

To meet the increasing ethylene market, producers should consider the installation of ethylene recovery plants of capacity considerably larger than initial requirements.

Ethylene Oxide Manufacture

Second paper of the morning session was by R. P. van Oosten (*Bataafse Internationale Chemie Mij*) on "The Manufacture of Ethylene Oxide". He mentioned that ethylene oxide was first prepared by Wurtz in 1859 by a chlorohydrin process. In 1937–38 the first commercial plant for producing ethylene oxide by direct oxidation of ethylene was brought into operation by Carbide and Carbon Chemicals Corporation (now Union Carbide Chemicals Co.). Since 1953 the number of units using direct oxidation has steadily increased, and all are based on either the Union Carbide, the Scientific Design, or the Shell process. To-day, the world production of ethylene oxide by direct oxidation is almost equal to that produced by the old chlorohydrin routes.

Reasons for the preference for the new processes are: (1) The direct oxidation process does not give substantial quantities of by-products, while the chlorohydrin process produces large quantities of by- and waste-products, the disposal of which is often difficult; (2) No chlorine is used in the direct oxidation process; (3) Post-war chemical engineering developments have helped to solve problems which previously prevented the commercial exploitation of the direct oxidation process.

The author showed that the U.S.A. consumption of ethylene oxide rose from about 450 million pounds in 1950 to 910 million in 1955, and is estimated to be 1250 million in 1960. The main usage is for ethylene glycol, although its relative importance is decreasing (from 69·3 per cent in 1950 to 60·8 per cent in 1960). Non-ionics and ethanol amines are increasing as consumers of ethylene oxide (from 11·3 per cent in 1950 to 21·2 per cent in 1960), the balance being used for the manufacture of polyglycols, acrylies, and glycolethers.

The paper concluded with descriptions of the reactions employed in the chlorohydrin process and in the direct oxidation process.

Chemicals from Ethylene and Propylene

The first paper in the afternoon session, under the chairmanship of Professor R. N. Haszeldine, Professor of Chemical Technology in the University of Manchester, was presented by Dr A. F. Millidge (*Distillers Co. Ltd*). He said that a considerable part of the new heavy organic chemicals industry was based on ethylene and propylene from petroleum feedstocks. He proposed to survey the field of chemicals from ethylene and propylene, except for the polymer and ethylene oxide production dealt with in other papers.

The production of industrial alcohol by fermentation of molasses is giving way to routes based on hydration of ethylene, and ethanol production from ethylene is second only to ethylene oxide. Two routes to synthetic alcohol are (i) reaction of ethylene with sulphuric acid and hydrolysis of the sulphuric esters produced, and (ii) vapour phase hydration over a supported acid catalyst.

Ethanol is widely used as a solvent but its main outlet is as an intermediate in the chemical industry. Large quantities are converted to ethyl esters of various acids (*e.g.* acetic), but the largest use is for making acetaldehyde for conversion into other chemicals. These latter include acetaldehyde, ethyl acetate, ketene, acetic anhydride, butadiene, and acetone.

Two processes are available for the hydration of propylene to isopropanol, one based on absorption in sulphuric acid and the other on the mixed-phase reaction of propylene and water over a solid catalyst.

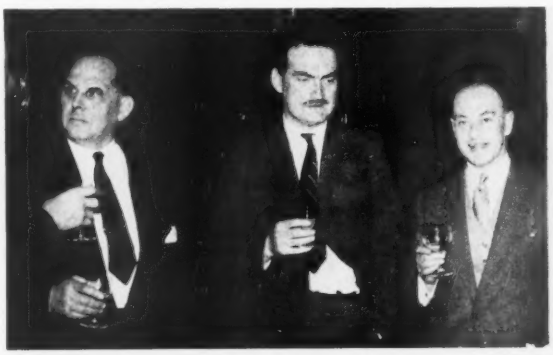
Most of the isopropanol manufactured is converted by catalytic dehydrogenation to acetone, over half of which is used as an intermediate for production of other organic chemicals.

Some of the uses of propylene were discussed by the author who, in conclusion, said that the simple olefins ethylene and propylene had become versatile raw materials in the hands of the skilled chemist and the chemical engineer. More new or improved processes were certain to come as the result of the present considerable research efforts into this small corner of organic chemistry.

Butadiene

A. A. Appleton (*Esso Petroleum Co. Ltd*), in his paper on "The Production and Utilization of Butadiene", said that it was first obtained in 1863 by pyrolysis of fusel oil.

At a dinner to the Manchester speakers the chairman was W. E. Huggett, deputy chairman of the Branch, seen here (left) *with P. J. King and H. Kaye who had been responsible respectively, for the papers and the organization.*



The professors foregather at the Manchester dinner. F. Morton, R. N. Haszeldine, G. Gee, and C. E. H. Bawn.

A limited number of processes for butadiene manufacture had been employed industrially and these were discussed by the author. They include the Aldol processes, dehydrochlorination of dichloro butane, *cyclo*hexane pyrolysis, the Reppe process, alcohol dehydration, butene dehydrogenation, butane dehydrogenation, and cracking.

The crude butadiene produced by these processes requires extraction by a suitable process. The two processes which find wide application are (i) liquid liquid extraction with cuprous ammonium acetate, and (ii) the furfural process in which the feed is depropanized and charged to a butylene splitter column where butadiene is concentrated in the overhead product. This product is fed to an extractive distillation column, lean furfural being charged at the top.

About 85 per cent of the butadiene made in the U.S.A. is used in the manufacture of SBR, about 2 per cent for N-type rubber, and about 2 per cent for adiponitrile for nylon.

Olefin Polymerization

With Professor G. Gee, Professor of Chemistry at the University, the evening session was devoted to an inspiring address by Professor C. E. H. Bawn, C.B.E., F.R.S. (*University of Liverpool*). His subject was "New Developments in the Polymerization of Olefins".

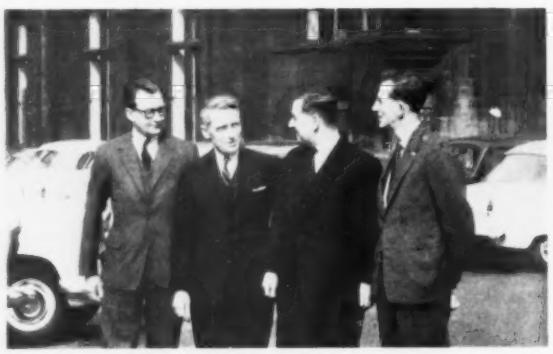
The discovery of the Zeigler catalyst for the polymerization of olefins, and the subsequent development by Natta and other workers of catalysts for the production of a new class of sterically regular polymers, have opened up new branches of high polymer research which are both of great scientific significance and of commercial importance. Within a few years of their discovery these new processes have had an enormous impact on polymer science and technology. These developments were reviewed by Professor Bawn, and he discussed both the nature of the Zeigler-type and related catalyst systems, and the mechanism of polymerization of olefins and dienes. Catalysts of other kinds, such as supported metal oxides for the low-pressure polymerization of ethylene and other olefins, were also dealt with.

The properties and structures of the new olefin polymers and their applications were surveyed.

Vote of Thanks

Bringing the meeting to a close, Professor Gee expressed the thanks of all present to the authors for the papers, all of which were important contributions to the knowledge of the lower olefins.

Chairman and speakers at the Manchester afternoon session. R. N. Haszeldine, A. F. Millidge, A. A. Appleton, and G. Gee discuss some points before lunch.



FUEL OIL

Held in the Houldsworth School of Applied Science of the University of Leeds, this symposium can be accounted one of the most successful meetings of its kind. For some four hours an audience of about 130 members of the Branch and others listened to and discussed three papers dealing respectively with theoretical and practical aspects of the use of fuel oil in industrial furnaces.

The three papers were:

"The Scientific Principles of Combustion of Fuel Oil", by Dr J. E. Garside, B.Sc. (*senior lecturer in Fuel Technology, The University of Leeds*);

"Combustion in Practice", by C. A. Roast, A.M.I.Mech.E., A.M.I.Elect.E. (*Esso Petroleum Co. Ltd*);

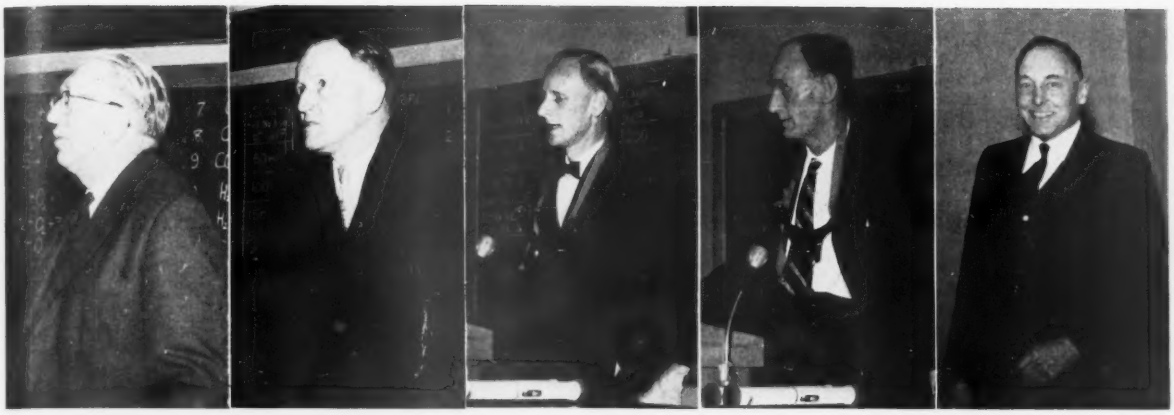
"Recent Applications of Fuel Oil", by T. Chippindale, A.M.I.Mech.E. (*Shell-Mex and B.P. Ltd*).

The meeting was formally opened by G. J. C. Vineall, chairman of the Yorkshire Branch, who introduced the chairman of the meeting, Professor A. L. Roberts, B.Sc., Ph.D.

Opening the meeting, Professor Roberts welcomed the members of the IP Yorkshire Branch, and the audience in general, to the new Houldsworth School of Applied Science. The building was a new one, he said, and it was appropriate that one of the first uses of its lecture theatre should be for a discussion on fuel uses.

Principles of Combustion

Dr Garside pointed out that "fuel oil" strictly ranged from kerosine to almost asphaltic bitumen, but in Britain the extremes of this range were excluded. In practice, fuel oil consists of mixtures of distillates and residues, the blending of which to meet specification requirements is an



At Leeds the Branch chairman, G. J. C. Vineall (left) *formally opened the meeting and invited Professor A. L. Roberts to take the chair. Lecturers were J. E. Garside, C. A. Roast, and T. Chippindale.*

operation of considerable skill. In terms of viscosity they vary from 45 Redwood I seconds at 100 F for a gas oil, to 3500 seconds for extra heavy fuel oil, the gross calorific values ranging from 18,000 to 19,200 Btu/lb.

All fuel oils are not derived from petroleum. There are the coal tar fuels blended from creosote and anthracene oils and pitch. There are six such fuels varying in viscosity from 60 Redwood I seconds at 100 F to 5000 seconds at 135 F. Calorific values range from 16,000 to 16,500 Btu.

A noteworthy difference between petroleum fuels and coal tar fuels is that the former are essentially paraffinic in composition and the latter aromatic.

The object of combustion is to secure the release of energy as heat by causing the combustible constituents—carbon, hydrogen, and sulphur—of the fuel to react with oxygen or air. Flame generally accompanied these reactions, and therefore the fuel has to be vaporized and the vapour mixed with air.

Dr Garside then described the chemical and the thermo-chemical principles of the combustion of fuel oil.

Dealing with vaporization, the author said that the rate of vaporization increased as the surface area : volume ratio increased. For this reason the oil jet should be broken into small droplets, or vaporized, the achievement of a fine mixture depending largely on viscosity and surface tension.

In order to obtain complete combustion, air in excess of the theoretical air requirement must be supplied. The correct amount of excess air can be calculated from the amount of carbon dioxide in the flue gases.

A small section of the Leeds audience

Combustion in Practice

Mr Roast began by pointing out that as fuel oil will not easily burn in bulk it has to be physically conditioned if complete combustion is to be achieved. It must be presented to the furnace in the form of tiny droplets ranging in diameter from 0·00008 to 0·008 in, according to the type of application. For example, a relatively cold burning environment, such as is offered by a tubular type industrial boiler, would warrant a very small droplet size whereas with high temperature processes, such as an open hearth steel furnace, larger droplets may be preferred. Droplet size will depend upon the characteristics of the burner employed and the viscosity of the fuel entering the burner assembly. There are four main types of burner each being classified according to the atomizing principle employed, namely mechanical pressure jet, air blast, steam blast, and rotary cup; hybrid burners incorporate more than one atomizing principle and it is often claimed that they offer a finer and more uniform degree of atomization.

All these burners are capable of handling the various grades of fuel oil marketed in Britain, but as the fineness of atomization will be influenced by the viscosity of the oil passing into the burner nozzle, it is essential to provide some form of pre-heat with residual grades. The degree of pre-heat will depend upon the grade of fuel, the characteristics of the burner, and the type of installation.

The means of combustion air supply and the quantity of air employed were said to be of some considerable importance. In metallurgical furnaces excess air can result in a very expensive loss of metal due to oxidation. With some oil-fired boilers it has been established that unnecessary quantities of excess air are responsible for serious corrosion in the low temperature zones. The corrosive component of the gas is sulphur trioxide, which reacts with water vapour to form sulphuric acid. Recent work has established that the production of sulphur trioxide is influenced by the quantity

of excess air in the combustion chamber. For example, with 5 per cent excess air the sulphur trioxide concentration may be in the order of 5 ppm, whereas with 20 per cent excess air it could well be 40 or 50 ppm. Whilst many oil burning installations operate fairly satisfactory on natural draught, there is little if any doubt that much closer combustion control can be maintained with mechanical draught. In fact there are few cases where the cost of the fan and its running costs cannot be paid off within a very short period.

Mr Roast went on to emphasize that if a very high standard of performance is to be forthcoming every installation should undergo acceptance tests; these should include measurements of carbon dioxide and smoke density, because it is only by this method that the burner equipment can be efficiently tuned to the working conditions.

After acceptance tests, the plant should be maintained in an efficient condition and a periodic maintenance system instituted. This is particularly important for residual oil burning installations because any unburnt carbon or other deposition on the burner nozzle will render atomization of the fuel somewhat difficult. In such circumstances the spray pattern is likely to be distorted and the efficiency of oil/air mixing impaired.

With oil burning, reducing or oxidizing atmospheres can be produced provided that the correct type of burner is installed. Whilst flame shape will be governed to some extent by the aerodynamics of the furnace and the flue system, considerable control can be exercised over flame patternation with current equipment.

Fuel Oil Applications

Not only are the other applications of fuel oil being repeated and increased in efficiency, but the use of oil firing is continually being applied in new ways to different processes, said Mr Chippindale.

For rotary pin heating furnaces a burner has been developed in which hot combustion products are recirculated into the flame to accelerate the combustion rate. No excess air is required.

In normal practice a combustion chamber volume of about 2·5 cu ft was allowed per gallon per hour of fuel, equivalent to a heat release of 70,000 Btu/cu ft/hr. High intensity combustion chamber devices have been developed capable of at least 1 million Btu/cu ft/hr.

One type of high-duty chamber is made in diameters of 18 in to 5 ft, length being equal to diameter. The large chamber releases some 15 million Btu/hr. This chamber can also be used as a gasifier, and this is being developed.

An earlier gasifier, the OCCR, was in use in large numbers on the Continent, the character of the gas depending mainly on air : oil ratio. The higher this ratio the lower the calorific value of the gas.

The high temperature of the oil flame can be a disadvantage in lower temperature processes and ways have been devised to obtain even heat distribution. In a tin plate annealing furnace it has been achieved by the use of a large number of small capacity burners. A heat-treatment furnace to operate at any pre-selected temperature between 200 and 1000 C has two proportioning low-pressure air burners firing into a combustion chamber separate from the treatment chamber.

An oil-fired furnace recently built for heating ingots of up to 65 tons has 28 burners in four controlled zones, oil consumption averaging 70 gallons/hr with 140 gallons maximum and 30 gallons minimum. The oil firing of muffle tunnel kilns presented difficulties due to limited combustion space and insufficient width to allow for flame development. An angled burner has now been developed and gives satisfactory results.

A recent British development in the firing of top-fired brick and tile kilns is the impulse system in which the number of injections can be controlled to 3 to 12 per minute.

INDUSTRIAL WASTES DISPOSAL

The Fawley symposium covered an interesting cross section of the subject of disposal of industrial wastes, two of the papers being devoted specifically to the petroleum industry. The five papers read and discussed during the two sessions, which were presided over respectively by Dr F. Mayo (*Fawley Branch, Institute of Petroleum*), and Dr J. M. Wright (*Mid-Southern Counties Section, Institute of Chemistry*) were:—

In the Fawley discussion on industrial wastes the authors of papers were (left to right) *F. E. Ireland, A. B. Wheatland, D. G. Turpin, G. J. C. Nash, and A. W. W. Kirby.*

"The Problem of Waste Disposal", by F. E. Ireland (*deputy chief alkali inspector, Ministry of Housing and Local Government*);
"Treatment of Industrial Effluents", by A. B. Wheatland (*Water Pollution Research Laboratories*);
"Oil Refining Waste Disposal Problems", by D. G. Turpin (*Esso Petroleum Co. Ltd*);
"Treatment of Radioactive Wastes", by G. J. C. Nash (*U.K. Atomic Energy Authority*);
"Pollution Problems and Amenities of the Countryside", by A. W. W. Kirby (*Shell Refining Co. Ltd*).

A breath of fresh air in the lunch interval at Fawley. (Left to right) *D. G. Turpin, A. W. W. Kirby, Dr F. Mayo (Fawley refinery manager), S. Berridge (chief chemist), F. E. Ireland, and A. B. Wheatland*

Dr F. Mayo, opening the first session, welcomed the delegates on behalf of both institutes, and also on behalf of Esso Petroleum Company.

The question of disposal of industrial wastes was very important, he said. It was not something of which industry and the authorities had just become aware. The problem had existed for a long time, but had become accentuated since the war with the rapid growth of industry and the realization of the limits of the countryside. Industry had, and readily accepted, the great responsibility to see that good land, water, and air were kept as clean and as "livable" as possible. The symposium was going to be a great help in discussing some of the problems which were encountered.

General Aspects of Pollution

Waste products in practice were well mixed in the solid, liquid, and gaseous phases and were disposed of to three sinks—the earth, the sea, and the air. What started in one phase often ended as something different, said Mr Ireland. Thus, coal mining produces some 60 million tons of spoil annually for disposal. This means a loss in amenity and of great tracts of land and there can be serious air and river pollution. Solid wastes often contain soluble materials which can be washed into streams by rain. Organic matter undergoes exothermic oxidation by air, and may cause spontaneous combustion. Air pollution is caused by hydrogen sulphide, sulphur dioxide, and other gases.

A recent case of liquid disposal causing an air pollution problem was the "tom-cat" smell on Teeside. An apparently harmless liquid waste running into the river, already badly deoxygenated by industrial waste, reacts with sulphides in the river to form a penetrating and obnoxious odour. Conversely, an air pollution problem can be transformed into one of river pollution.

On the problem of air pollution by oxides of sulphur, Mr Ireland noted that in 1958 the amounts of sulphur dioxide emitted to air by fuel users was 4,390,000 tons from coal, 390,000 from coke, 50,000 from diesel and gas oil, and 590,000 from fuel oil. Maximum allowable concentrations in which men may work for 8 hours without risk or harm are 29,000 micrograms per cubic metre for sulphur dioxide and 1000 micrograms for sulphuric acid mist. Present sulphur dioxide concentration in towns, averaged over the year, is about 200 micrograms per cubic metre.

Apart from sulphur dioxide, another aspect of power station operation was ash disposal, of which about 9·3 million tons have to be disposed of to land and 200,000 tons pass into the air per year. The greatest nuisance from iron and steelworks is perhaps the red cloud of iron oxide dust emitted with combustion gases. A 98 per cent arrestment is often necessary and the solution will be costly.

Reference was made to the emission of dust from cement kilns and of fluorine from coal burning, iron and steel works, aluminium, ceramics, etc.

After discussing formulæ for calculating the required height of a chimney for gas dispersal, Mr Ireland concluded with a brief reference to the laws relating to disposal of industrial wastes.

Industrial Effluents

With demands for water continuously increasing, any pollution of rivers must be a matter for concern, said Mr Wheatland. While it is advisable that trade effluents are discharged to a sewer for treatment, that is not always practicable.

He then discussed the steps necessary to prevent pollution and the methods of treatment. Special attention was given to metal-finishing wastes and to organic wastes.

Referring to oil emulsions, he said that in some engineering factories these emulsions are first passed through chambers in separate grit and free-flowing oil and are then treated with chemicals to break the emulsion. Aluminium and ferric salts in concentrations of 1000 to 10,000 ppm are generally effective in breaking emulsions, and common salt in concentrations of 4 to 6 per cent is sometimes preferred.

Oil Refining Waste

Anti-pollution facilities are an integral part of modern oil refinery design, and the installation costs of such facilities at Fawley, are nearly £2 million, said Dr Turpin. About £100,000 is spent annually on new and improved equipment.

The largest liquid effluent is oil-contaminated water, the disposal of which is governed by several acts and by-laws. About 144 million gallons of sea water are used daily for cooling purposes, and before its return to the sea its oil content must be less than the prescribed 50 ppm. To achieve this, the effluent water is passed through four API gravity separators.

Hydrogen sulphide-bearing water and spent caustic soda solutions are the only liquid chemicals needing treatment before disposal. Spent caustic needs deodorization and the present equipment for this consists essentially of a carbonating tower and a steam stripping tower.

Total solid wastes—sludges, spent clay, catalysts, chemicals—at Fawley amount to between 8000 and 9000 tons per year, of which about 3600 tons are incinerated. The remainder is dumped.

At Fawley three hydrogen sulphide-containing streams are extracted and each has its Girbotol extraction unit. These

units feed H_2S to two sulphur recovery plants to produce 70 to 80 tons daily of pure sulphur.

Stack gases containing sulphur dioxide are released to atmosphere at 250 feet above ground level where they disperse. Concluding, Dr Turpin said that a great deal of work was being carried out in British refineries on all aspects of atmospheric pollution.

Radioactive Wastes

Stating the nature of the problem of the disposal of radioactive wastes, G. J. C. Nash noted that the primary fission products range in mass number from 72 to 161, covering upwards of 30 elements with nuclei in the region of 95 to 119 predominating.

The magnitude of the problem is such that by 1965 the U.K. alone will be producing 6000 MW of electrical power by nuclear fission to give annually 6 to 8 tons of long-term fission products of radioactivity of 10^9 curies. To reduce the concentration of fission products to the permitted level of drinking water, 10^9 curies will require 10^6 cubic miles of sea water. By 2000 the global figure for atomic power is estimated at 10^{11} curies.

After surveying various aspects of dealing with radioactive effluents, the author said that the ultimate goal was the "closed site". In this, purified effluents will recycle as process water and discharges to environment will be confined to those containing negligent amounts of radioactivity.

Pollution and Amenities

The main atmospheric pollution problems associated with petroleum refineries are fuel flue gases, particularly in relation to sulphur dioxide content and characteristic odour. Even under smog conditions, highest concentrations of SO_2 detected in Britain are about 1·6 ppm and there is a growing belief that SO_2 per se was not harmful in such or less concentrations, said Mr Kirby.

There is more factual knowledge of the effects of SO_2 on vegetation, and as a generalization 0·4 ppm was likely to cause damage. Experiments have been carried out extensively at one of Shell's British refineries, and details of the findings were given by the author. Results of a SO_2 dosage survey which followed the trial plot work show, first that the general level of SO_2 dosage in refinery areas is not higher than in light industrial areas. Secondly, contours of equal dosage show two foci in the area—one the refinery and the other a large generating station.

Dealing with the subject of oil pollution of water, Mr Kirby referred to work done in Holland on improved design of API interceptors. The main basin is divided into sections by parallel plates. With plates parallel to the direction of flow, an original oil content of 400 ppm is reduced to 59 ppm compared to 106 ppm without plates. With plates inclined at 45 , oil content of effluent is 20 ppm against 40 ppm with open bays.

* * *

Around the Branches

ABADAN, BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD, YORKSHIRE

South Wales Branch

On 10 March, the South Wales Branch was addressed by Professor C. H. Hassall, Ph.D., F.R.I.C., of the University College, Swansea, on "Chemistry in the Service of Medicine".

Professor Hassall commenced his talk by commenting on the remarkable expansion of research in chemistry. During the first sixty years of the nineteenth century there was an average per annum of 3000 publications concerned with all aspects of scientific research. In 1957 there were over 200,000 investigations on chemical topics alone. What had happened in the field of medicinal chemistry further illustrated this point. 70 per cent of the drugs in the present prescription list were not in use ten years ago.

Professor Hassall then gave a brief review of medical research during the last sixty years. There had been a dramatic change in the method of combatting disease: whereas at the end of the nineteenth century the main practice was to treat symptoms, later developments had been directed to the treatment of the actual diseases.

Modern chemotherapy began with the work of Koch and his school about the beginning of this century. This was followed by the development of hormone therapy, which was initiated by the discovery of insulin in 1920. Another dramatic change came in 1935 with the development of sulpha drugs, and this was later followed by the discovery of penicillin and the era of antibiotics. Between the two world wars there was the development of vitamins, which played a similar role to hormones in facilitating the control of metabolic diseases. The metabolic diseases had proved very difficult to master, but with the increase in basic knowledge there was every expectation of ultimate success.

Professor Hassall illustrated these developments with slides, and reviewed in some detail the work involved in developing drugs by the "screening" process. He then discussed a recent trend in the development of new drugs based on the knowledge of the molecular structure of biologically active compounds. This knowledge of structure was acquired by both physical and chemical methods. Given the molecular structure it was possible to synthesize drugs with related structures to participate in related biological processes. These methods were again illustrated by slides.

A number of interesting questions were answered by the speaker, and the chairman, A. Patrickson, concluded by thanking him for his fascinating address.

Fawley Branch

Modern Car Developments

The subject of the lecture by K. Arter, of Esso Research Ltd, given to the Fawley Branch on 10 February was "Modern Car Developments".

Dr F. Mayo took the chair and recalled some of the work done by Mr Arter and his association with people at the Fawley refinery.

The talk was mainly concerned with the development of car engines and other mechanical features, and was interspersed with anecdotes and slides. The presence of motoring enthusiasts in the audience was soon apparent from the discussion, which was opened by D. R. Weatherley. A wide experience of motor cars and an intimate appreciation of recent developments was evident in the way that Mr Arter dealt with the various questions.

There were perhaps one or two members who regretted that Mr Arter was not present at the January meeting, when, on an extremely cold night, a few people were unable to start their cars and were forced to abandon them for the night.

Man-Made Fibres

On 9 March the chair was taken by Dr F. Mayo for a talk given by Dr A. S. Carpenter, of Courtaulds Ltd, on "Man-Made Fibres".

Dr Carpenter combined in the one talk an easy-to-understand account of the development of man-made fibres, and brief excursions into the chemical structure of the types of fibre produced. Both technical and non-technical people in the audience showed a great deal of interest as Dr Carpenter used simple experiments, samples of fibres, and slides to show the different characteristics and merits of the various fibres available.

In the discussion there was much interest in the dominance of natural fibres, particularly cotton, in the textile field. There was a good deal of speculation as to which of the man-made fibres was likely to take an increasing share of the market. The speaker emphasized that cotton was a very good fibre indeed, and that its price was likely to maintain it in dominant position. Wool was a natural fibre with some weaknesses, such as lack of resistance to abrasion, and it was more likely to be replaced by man-made fibres. There was, however, a strong personal preference among the public for wool at the present time.

One of the greatest advantages of man-made fibres was that by selecting the spinning and weaving processes the textile could be uniformly produced according to the particular purpose for which it was being prepared. This point was most apparent when examining the many samples that Dr Carpenter brought with him.

At the end of a most entertaining evening the vote of thanks was given by A. W. Forster and was heartily supported by all present.

Scottish Branch

At a committee meeting of the Scottish Branch held on 23 February the following office bearers were appointed for the year 1960:—

Chairman	Dr W. B. Peutherer
Vice-chairman	D. Blair Watt
Hon secretary	W. M. Stirling
Hon treasurer	F. M. Cook
Hon recorder	J. G. Annan

In accordance with Rule 4(b) of the Scottish Branch Constitution and Rules the above appointments become effective from the date of the Institute's annual general meeting.

TRUSTEES OF THE INSTITUTE OF PETROLEUM BENEVOLENT FUND

REVENUE ACCOUNT FOR THE YEAR ENDED 31 DECEMBER 1959

To: Grants paid	£120	0	0	By: Subscriptions and donations received during year	£218	1	0
Bank charges	4	0		Interest and dividends received (gross) ...	123	16	9
Balance, being surplus revenue for year ...	221	13	9				
	£341	17	9		£341	17	9

BALANCE SHEET 31 DECEMBER 1959

REVENUE ACCOUNT				INVESTMENTS AT COST			
As at 31 December 1958	£4,031	0	5	£1,450 4½% Defence Bonds (Conversion Issue) ...	£1,450	0	0
Add: Surplus for year	221	13	9	£300 3½% Defence Bonds (Conversion Issue) ...	300	0	0
	£4,252	14	2	£200 3½% Defence Bonds (2nd Conversion Issue)	200	0	0
				£100 5% Defence Bonds (Conversion Issue) ...	100	0	0
				150 Lloyds Bank Ltd £1 Shares	393	10	9
				120 Associated Electrical Industries Ltd Ordinary Stock £1 Units	365	19	6
				200 Imperial Chemical Industries Ltd Ordinary Stock £1 Units	379	9	6
				75 Tube Investments Ltd Ordinary Stock £1 Units	342	7	8
						£3,531	7 5
				(Market Value £4,078)			
				SUNDRY DEBTOR—Income tax recoverable ...		10	0 11
				BALANCE AT BANK—Current account		711	5 10
	£4,252	14	2			£4,252	14 2

We have examined the above Revenue Account and Balance Sheet with the books and vouchers of the Fund and find it to be in accordance therewith.

(Sgd) SMITH & WILLIAMSON,
Chartered Accountants.
Auditors.

Scottish Union House,
25 Bucklersbury,
London, E.C.4.
31 *March* 1960.

OIL SEARCH IN THE PERSIAN GULF

Steel towers, weighing 200 *tons and standing* 120 *ft above the ocean bed, are fitted round the well heads at Umm Shaif. In this picture the first section of the tower for the No* 3 *well is seen being lifted by the drawworks of the* Adma Enterprise *from the barge which transported it from Das Island*

Abu Dhabi Marine Areas Ltd, which is owned 66⅔ per cent by The British Petroleum Company and 33⅓ per cent by Compagnie Française des Pétroles, has started development drilling on the Umm Shaif structure east of Das Island, where it has been carrying out exploration drilling since early 1958.

In 1953 the Ruler of Abu Dhabi granted the Anglo-French firm an exploration concession over some 1200 sq m of the waters of the Persian Gulf. Surveys were then made, including geological investigations of the ocean bed by Commandant Cousteau and others.

The preparation of a base on Das Island involved the installation of servicing facilities, an administrative centre, and a rest camp, and in August 1957 the drilling barge *Adma Enterprise* began its long voyage from Kiel. Early in January 1958 the 4000-ton barge was towed to its drilling location some 20 miles from Das Island, and the drilling of the first well, Umm Shaif No. 1, began on 14 January of that year.

Three wells have since been completed by the *Adma Enterprise*, which is now engaged on a fourth. No 1 well found oil in September 1959 in the Thammama formation at about 5500 ft, but the results from No 2 well were disappointing. No 3 was completed after finding oil in the Araej zone at about 9600 ft which was considered sufficiently encouraging to embark on preparations for commercial production.

This will involve the construction of a 20-mile submarine pipeline to bring the crude from the field to Das Island. Gas/oil separators will be installed on the island along with storage tanks and a tanker-loading jetty. This work will take approximately two years to complete.

So, just over two years after the commencement of drilling on the site, plans for the first British production in the Persian Gulf are being actively initiated.

The successful exploitation of the Umm Shaif discoveries brings renewed incentive to the search and drilling activities which are at present in progress in various parts of the Persian Gulf.

The only part of the Gulf in which an actual producing field is located is at Safaniya, off the coast of Saudi Arabia. This was discovered in 1951 and production was delayed until the construction of a pipeline to the land was completed. Present output of about 60,000 bd of 27° API crude is from 21 wells. An additional 12 wells are shut in.

To the south of Safaniya the more recently discovered Saudi Arabian field at Manifa is shut in. The sixth well on the site is now being drilled, and further delineation and development wells are scheduled for 1960.

Kuwait-Saudi Arabia Neutral Zone

The first commercial oil discovery in the offshore waters of the Kuwait-Saudi Arabia Neutral Zone was made by the Japanese concern, the Arabian Oil Company, on 29 January 1960 in about 104 ft of water some 30 miles from the Neutral Zone coast. The find was reported to have been between the Upper Burgan at 4820 ft and the Lower Burgan at 5200 ft. The crude is said to be about 26° API, containing 2·7 per cent sulphur, and producing at a rate of over 6000 bd through a ¾ in choke. The well is named Khafji No 1.

This successful discovery followed on the somewhat disastrous earlier activities on the site. Drilling there was begun in July 1959 and was held up for over three months by a gas strike at 1500 ft which resulted in a blowout and a fire, which, burning for nine days, totally destroyed the rig.

Three miles to the west, and with Safaniya 40 miles to the south-west, the first stepout well is being contract drilled by International Drilling Company from a Le Tourneau-type platform. A further 8 or 9 wells are planned before the end of 1960, and a production of some 40,000 bd by 1961.

Plans for the development of this discovery are moving ahead. A company, Yokkaichi Yuso, has been formed in Japan to sell the crude, ownership being Daiko Oil Co. 60 per cent and Japan Petroleum Trading Co. 40 per cent.

Evidence of the speed with which the Japanese desire to begin full commercial production at Khafji is provided by reports which allege that several T-2 tankers are to be anchored alongside the wellheads to provide temporary crude storage. Some terminal facilities are under construction at Ras al Khafji in the Neutral Zone.

Iran

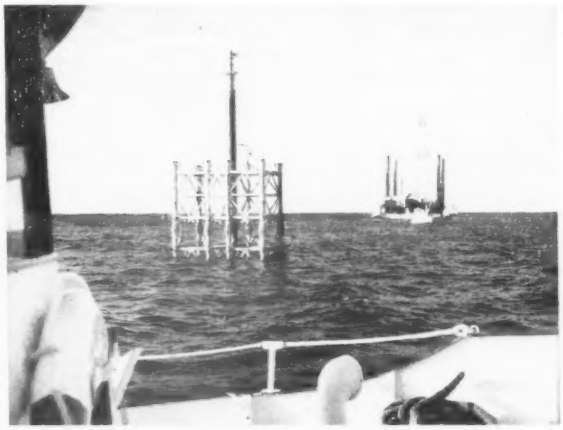
Further offshore drilling activity is also in progress in Persian waters near the head of the Gulf. Non-commercial

oil shows were reported in the first offshore well to be drilled by the Société Irano-Italienne des Pétroles (SIRIP), the NIOC-AGIP Mineraria venture. This well is located 6 miles off the coast in 18 in of water, and drilling is continuing. At the end of April a depth of 9660 ft had been reached, a core having been cut from 9398–9408 ft. A second well is shortly to be drilled in 142 ft of water at a spot about 20 miles south of Kharg Island.

Iran Pan American Oil Co. (IPAC), a joint subsidiary of NIOC and Pan American Petroleum Corp (S.O. (Indiana)), is also engaged in offshore drilling on its concession block adjoining that of SIRIP. The only well drilled so far, A1, is from a mobile drilling platform midway between Kharg I and the Shatt al Arab, 58 miles from shore in 126 ft of water. Oil shows were encountered at about 11,500 ft, but drilling is continuing to the target depth of 14,000 ft. At the end of April progress had reached about 13,000 ft.

A second well (B1) is planned to be drilled to about 13,000–14,000 ft from a fixed platform in 142 ft of water, 25 miles from Bushire, in the next few months. At the time of writing equipment was on location and rigging up was being commenced. Seacat Marine Drilling Co. are the operators for IPAC.

The exploration operating company of the Consortium has been engaged in a marine gravity survey over the past few months of parts of its territorial waters concession area westward from Bandar Abbas.



Adma Enterprise *is towed away from the well head leaving Umm Shaif No* 3 *well with its tower isolated in the empty expanse of the Persian Gulf*

Qatar

Across the other side of the Gulf, The Shell Co. of Qatar's mobile marine drilling platform, the *Seashell*, is now drilling in a depth of 100 ft of water, and at the end of April had reached about 8000 ft. The location is about 50 miles from the coast. The previous Shell operations were brought to a halt near the end of 1956 when the drilling structure was wrecked in a storm after two dry holes had been drilled.

Kuwait

The Ruler indicated in 1956 that he would consider offers for concessions offshore from Kuwait and the Neutral Zone. This resulted in the Neutral Zone agreement with Japan Petroleum Trading Co., but the decision regarding the offshore area of Kuwait was deferred.

Recently the Ruler made a fresh announcement on this subject. Fresh offers will be considered from responsible companies or groups of companies, and the Ruler hopes to have made his decision upon the applications by November this year.

This area which is open to application begins where Kuwait Oil Company's own concession area extends, six nautical miles from the coast, and where they have in the past done some geophysical work. The offer is bound to attract a good deal of interest, for it begins within 20 miles of the Burgan field.

★ ★ ★

SONJ IN 1959

In the Company's 1959 annual report Standard Oil Company (New Jersey) announces that its total world-wide sales of petroleum products were 2,991,000 bd during the year, an increase of 8 per cent.

Consolidated net earnings were up by 12 per cent to a figure of $630 million, whilst consolidated capital expenditures during 1959 for property, plant, and equipment decreased by 15 per cent to $729,146,000. In addition, $197,203,000 was spent on the search for crude oil and natural gas.

Taxes and other payments to the U.S. and foreign governments, at $2,517,800,000, were more than double employee wages and benefit costs and five times the dividend payments to shareholders.

The Group's revenue from world-wide petrochemical sales was $256 million, which was a notable increase on the previous year, and indicative of the growing importance of this sector of the industry. It is reported that about 25 cents of every dollar now spent by SONJ on research is directed in petrochemicals. Total research expenditures in 1959 were over $67 million.

The gross production of crude oil and natural gas liquids achieved by the Group averaged 2,464,000 bd—a 6 per cent increase over 1958.

Total revenue from sales of natural gas and gas liquids was approximately $140 million, whilst natural gas sales in the U.S.A. rose by 16 per cent to 1526 million cu ft/day. Jersey Standard's U.S. gas reserves were stated to exceed in energy content its domestic reserves of crude oil.

In the first quarter of 1960 estimated earnings for the Group were 2 per cent up on the corresponding quarter of 1959, and an increase of 11 per cent over the final quarter of 1959.

Product sales volumes in the first three months increased by about 5 per cent compared with the 1959 period and by more than 3 per cent over the Oct.—Dec. period. Total revenues from sales and investments were estimated as being $2212 million in the quarter ($56 million increase), and capital and exploration expenditures $186 million ($14 million less than the 1959 quarter).

*Oilfields: Past, Present, and Future**

By R. H. W. HAMILTON†

The theme for this paper is a consideration of the factors which have influenced the development of oilfields in the past, and from this a deduction of the type of oilfields to be expected in the future.

Oilfields in the modern sense have existed in the world for some hundred years and the trends of development can be considered under the main headings of transport methods: equipment available: and personnel.

Transport Methods

In the days of the horse and buggy the limitations of transport, both for delivering the oil produced and for moving in equipment for development, undoubtedly restricted the development of oilfields. The tendency was then for oilfields to be in the vicinity of ready markets.

Oil in remote places was of little value for it could not be transported economically, and in any event the cost of development would have been very great.

With the advent of the oil tanker, the pipeline, and modern land transport, oilfields were developed in ever more inaccessible places, and this proved to be economic.

The final stage of improved transport with super tankers, big-inch pipelines, modern land vehicles, and the advent of the air age makes the development of oilfields worthwhile practically anywhere in the world. Obviously this only applies to fields of reasonable size and productivity. Thus an ever-widening trend in the location of oilfields can be discerned during the past century.

Equipment Available

The equipment available for oilfield development has allowed ever-increasing depths to be reached in the wells. Drilling by cable tool methods began to change over to the rotary method in the 1920's, and after the second world war steam gave way to the diesel as the main motive power on rigs.

Since the development of scientific mud control and the advent of reliable blowout preventers, the whole operation of drilling has tended to become much safer. The removal of derricks or masts on completion of drilling has meant that completed wells are far less evident than they used to be.

Advances have been made in all types of oil-handling equipment from the wells to the collection centres, and there advances have allowed the higher pressures resulting from deeper wells to be satisfactorily withstood. The automatic control of wells has now been proved to be entirely practicable, and such control has even been extended to provide for the automatic periodic testing of wells.

Oil pumping systems have also been immeasurably improved, and now with the gas turbine it is commonplace to pump large quantities of crude reliably over great distances, the whole system being automatic. Control of pumping stations by means of radio links from remote positions is now commonly carried out.

Accordingly, the trend of improving equipment has led to the satisfactory handling of higher pressure crudes from greater depths and an ever-increasing degree of automatic or remote control in the plants.

Personnel

The type and number of men engaged in oilfield development have shown remarkable changes in the past 30 years or so.

Physical strength was one of the prime requirements before the advent of the mechanical age called for greater intelligence. With modern methods of transport and the use of up-to-date equipment, the requirement for experience and skill in making use of the machine is of first importance. With the ever-increasing complexity of modern equipment, correct maintenance has come more to the fore, and the so-called technician with specialized knowledge and skills has become a very important element of oilfield development work.

The numbers of men engaged in work actually on the oilfields themselves has shown a great change. When the common practice was to man-handle equipment of all kinds as far as practicable, large labour forces were common. Now there is a machine for practically every operation and the number of men has been greatly reduced on the fields, many of them being employed in central depots and workshops maintaining the machines.

The present result of these trends is that fewer and fewer men are to be seen on site, and that the type of men has been changed by skill and training.

A Modern Oilfield

The modern oilfield may be located in an out-of-the-way place, the equipment being brought to site from seaboard by heavy trucks of the most modern type. There will be little man-handling of the materials on the fields, as this will largely be done by mechanical means. The field may even be out at sea, or in a lake, where transport will be by marine craft and barges.

The equipment itself will tend to be bulky, and prefabricated as far as possible to avoid expensive local construction. Where equipment is for a service such as drilling it will probably be in complete, highly-expensive units which must be kept working at full pressure to justify their initial cost. This applies particularly to marine drilling barges, where the capital investment is very high and delays in service are proportionally expensive. One of the most recent methods which have being used to lessen this expense are rigs that will drill more than one well simultaneously.

Pipe laying will practically all be done by mechanical means, pumping station and other such plant will probably arrive in a form that has been engineered down to the last detail, and erection expenses will thereby be kept to a minimum. Thus, apart from a select number of sites where there is concentrated activity, there will be little sign of work being carried out. The drillers, welders, and erection technicians with their crews may be seen at work on the field with their supporting motor transport but little else.

It is in large offices that the design and planning for the entire field development takes place. The range of modern

* Presented to the inaugural meeting of the Exploration and Production Group on 23 February 1960.

† Iraq Petroleum Co. Ltd.

transport allows depots and repair shops to be remote from the field itself, and modern communications allow the central offices also to be away from the field. The main centre of the field development may be at quite a considerable distance from the field itself. This concentration of services permits a higher degree of comfort and better standards of living for the men.

The central organization will consist in the main of technically-skilled people divided into departments or sections of work. Each department will have a supporting staff of office workers and a vast number of forms will be filled out and returns rendered. It is here that the main scientific and mathematical studies will be carried out. The administration must ensure that the standard of the planning staff is high and that the needs of the many facets of the work are properly covered. Many skills are required and qualified technicians are needed in them all.

Unless a visitor has a good idea of the development plans for an oilfield, he can view it and still form little idea of what is being done. The central office will probably be the place where he will see more and learn more than he will by travelling many miles over rough roads.

Thus the form of an oilfield has changed over the last few decades from a hive of industry where the casual observer could see what was going on, to a place largely devoid of human beings and where the plant and equipment is not particularly noticeable. The human beings are there alright but they are mainly in central offices and depots.

Oilfields of the Future

It is to be expected that in the future transport by land, air, and sea will continue to improve in efficiency and load-carrying capacity, and hence oilfields will be able to spread out to the remotest parts of the earth. The equipment for development can also be expected to improve, and to become more complex. There will be an ever-increasing use of automatic machines, and the remote control of plant will probably become commonplace. Even the drilling of wells may become automatic to a large degree.

All this will call for an increasing degree of technical skill in maintenance and operation, and probably a tendency to remove the main central control of the oilfields even further away than at present. These new control centres will probably be located in the vicinity of cities where suitable living conditions can be provided for the skilled staff required.

It is possible that the numbers of those actually living on the oilfield may be reduced to a remarkable degree, and the routine maintenance will be carried out by visits of technicians by air, helicopters being used for local movement on the fields. Only when work is to be done on site will a team move out, and the team will be as small as practicable and stay for as short a time as possible. This presupposes most careful preparation for the job, and would result in the most economical employment of the team and the equipment it uses.

Detailed planning should avoid the need to hold large stocks of materials on the field itself, and hence base warehouses and depots can be foreseen from which materials are moved out to site as and when required. Similarly, overhauls and maintenance of heavy transport could be carried out at bases remote from the oilfields at places where some facilities are already in existence and suitable labour is available. This would avoid the building up of large workshops in out-of-the-way places with the attendant need to bring in, and house, the labour force, and to provide the facilities that will undoubtedly be needed to keep labour contented in the future.

Thus the oilfields at the close of the 20th Century—and there is no doubt that there will be many of them—can be expected to be in remote localities and to present very little for the eye to see. Such plant and equipment as installed there will be of a highly automatic type, and all will be operated by remote control.

There will only be a modest collection of buildings and stores on the field, and accommodation will also be very limited in extent and probably completely prefabricated.

However, there will be a large supporting organization at a centre possibly a long way from the field, and in the vicinity of a town or city. Modern buildings for offices, stores, and workshops will be the order of the day, aircraft and heavy transport systems will connect with the fields. Communications will be almost entirely by radio.

The picture of oilfields almost empty of people, who in fact live and work in amenable surroundings far away from the site, is very different from that to which most people in the industry are accustomed. But the trends to this development are already clear.

The people themselves will tend to be of rather a thoughtful, studious nature, and again very different from the sons of toil to be found on the oilfields of the past.

Do we welcome these changes? The answer depends on the point of view one adopts. For those who are addicted to efficiency it will be a great age, but for those who like the rough and tumble of oilfield life it will be an age without colour.

Whatever view is held, the changes are bound to come, and it is to be hoped that these few thoughts may be of assistance to those who are engaged in planning for the future.

DISCUSSION

In opening the discussion the chairman, H. Gilmour, pointed out that many new practices, such as slim-hole drilling, were directed in order to supply more money for the expensive projects of drilling to greater depths.

Mr Hamilton remarked that labour and skill was becoming so expensive that it would be economically worthwhile installing expensive machines. The main work in connexion with such developments on slim-hole drilling would be carried out by scientists working at a headquarters, and the projects would only be put into effect by a specialized team who, again, would not make it their practice to live on the site.

E. C. Masterson extended the theme of Mr Hamilton's paper by quoting some personal experiences in the oilfields.

In Kuwait, "gathering centres", each of which collect and separate about 100,000 barrels of oil per day, took 13 men per shift to operate in 1948. In 1959, by installing various fail safe equipment and other streamlining, four men per centre were all that was necessary, and by 1961 there would be only one man. Not quite 100 per cent automation, but very nearly so.

A more interesting case, perhaps, was the development of the new Raudhatain field in the north of Kuwait. This covered an area of about 12 miles from north to south by 11 miles from east to west, and contained about thirty wells, with an expected production of about 200,000 bd. It was located 60 air miles away from the main office and camp, and about 75 miles or so by road. With the conventional township, including offices, workshops, and taking the climate into consideration, 168 men would have been required to operate this field.

The capital investment required for building all the houses and facilities for this number would have been about £700,000. On second thoughts, therefore, it was decided that the field could be run with 29 men actually on the site, including nine cooks and other catering staff, because many people travel to and from the site in a Pionair aircraft on a day-by-day basis. The men would work just two shifts and reliefs would be supplied by light aircraft from Ahmadi. The total capital expenditure on the project would thereby be cut from £700,000 to something of the order of £100,000.

This gathering centre in North Kuwait would not be working by push-button from Ahmadi for a year or two, there would

still be one man on the site. If complete automation was adopted he would be removed. Automation was being tried first in the main field, because it was nearer to the office where it could be controlled. All this was due to this new thinking, and the availability of new methods of transport.

Another way in which oil field operation had become simplified was in the increasing use of local industries. Over the last few years local industries had been helped to develop by the company paying, at times, more than was the right amount for services in order to get them going. The result was that this year, for instance, all the transport—consisting of about a thousand vehicles—had been on contract. That had a great effect on total manpower, and since most oilfields seemed to be found in inaccessible places, it was useful to encourage these local industries in order to avoid building up investment too high at first, and then having to run it down. The outside services cost more, but in the long run investment costs were kept down.

Mr Hamilton said that Mr Masterson's figures of the reduction of labour force required to run the new units at Kuwait were paralleled by operations in the Four Corners area of the Western U.S.A. There no one lived on the site because the fields were on an Indian reservation. Everyone went out by car and the actual fields were entirely automatic.

In certain parts of Canada some fields could be completely snow-bound, but it was now arranged for them to work automatically for weeks at a time, whereas in the past they used to be shut down until the roads were open again.

In southern Iraq, in the Rumaila field, three new collection centres were being built to be entirely automatic. They would run with only the occasional visit from a technician and be controlled from the existing central station, so the whole field would operate from that one centre, which would in this case, be on the field. But it could easily be foreseen that, by the use of VHF links, the control could in the future be moved anywhere.

Sir Stephen Gibson pointed out that the field of Gachsaran had been completely automatic for over twenty years—being controlled from the refinery 166 miles away from the field.

E. V. Corps suggested that the various markers in a well that are picked up by visual examination of lithology, fossils, and by mineral content, or by logs, might one day be followed on television, so that the geologist and petroleum engineer could work from a central office rather than on the oilfield.

It was pointed out by H. C. Lack that several firms were already trying to develop down-the-hole television. One of the problems to be considered was the obscuring of visibility by the mud flow. He also brought up the question of the projected drilling to the Moho.

Dr T. F. Gaskell said that in the U.S.A. preliminary trials of drilling in deep water were being carried out because the Moho was much nearer the surface under the oceans than it was under the land. The first results of this work would be a geological section through the sediments that lie on the sea bed, which would give a geological story of the life of the oceans. If this was successful about $15 million would be needed to commence from a floating platform and drill right down through the earth's crust. This would entail about four miles of drilling. Well-informed opinion in drilling circles in the U.S.A. thought that it could probably be done with materials now available, but it was proposed to allocate about 10 per cent of the effort to research. From an oil company point of view the project could thereby do nothing but good. He remarked that while automation had decreased the staff required to run oilfields, such operations as geophysical exploration and exploration drilling required more people than in the past. In place of the old hand-dug holes where there was one man down the hole, one winding, and one on the bellows, the modern exploration drilling rig required—apart from drillers, tool pushers, and drilling superintendent—petroleum engineers, geologists, mud chemists, well-logging crews, and many other staff. Not much appeared to be going on to bring automation to drilling.

M. Zuur wondered how people would in future be trained to be oil-minded when they were all located in cities.

Mr Hamilton replied that this was one of the great problems of the future, because there was no doubt that a large number of scientists and chemists in places far removed from any oilfields, would have little idea as to what was happening there. It would be the responsibility of those who had been steeped in oil in the past to pass their knowledge on. Whether that would in fact produce the desired result it was very difficult to tell.

K. Barnes, commenting on the United States' point of view in the present trend in petroleum engineering, said that in the last quarter of a century petroleum engineering in colleges had changed from the teaching of the fundamentals of cable tool and rotary drilling to the complex courses, particularly in the field of reservoir engineering and fluid flow, that were being held to-day.

Automation was used in production, but in order to avoid importing crude oil it was necessary to produce from what would elsewhere be low-grade sands with marginal economics. Some of the answers for these thin sand, low reserve, oilfields in the future were coming out of the petroleum research laboratories. For example, hydraulic fracturing was being considered across an entire oilfield so that one or two widely spaced wells in this otherwise uneconomic field would be sufficient. Some oilfields had to be water-flooded from the start to make any profit at all, and perhaps some of the Four Corners fields would be produced by miscible phase displacement methods.

These economies were one of the most important things for future oilfields, because many of them would be only small ones.

Mr Hamilton said that this underlined the point that the future age was going to be one for the scientist, and possibly for the economist.

IP STANDARDS

A Correction

The correct designation of the method for Rust Preventing Characteristics of Steam Turbine Oil which appears in the 19th edition of *IP Standards for Petroleum and Its Products* is IP 135/60. The terms in which the results are reported have been amended considerably from the previous versions.

Withdrawal of IP Methods

Standardization Committee has decided that the following methods will be withdrawn from the 1961 edition of *IP Standards for Petroleum and its Products* for the reasons given:—

Carbon Disulphide Content—IP 108/57 T. This method is not applicable to the low concentrations of carbon disulphide encountered in petroleum products and does not appear to be used in the petroleum industry.

Spectrometric Analysis 1 : 3-Butadiene in C_4 Hydrocarbon Mixtures—IP 141/53 T. This method has been found to be unreliable and inaccurate. It does not appear to be used in the United Kingdom. The technically-equivalent ASTM method is D1096–54. It is hoped that a satisfactory gas-chromatographic method will be developed for the determination of the impurities in 1 : 3-butadiene and published in a later edition of IP Standards.

Middle East Oil Production

	March	*Jan.-Mar.*
	Tons	
Iraq Petroleum Co. Ltd	2,634,401	7,640,384
Basrah Petroleum Co. Ltd ...	1,090,406	3,070,573
Mosul Petroleum Co. Ltd ...	110,156	321,463
Qatar Petroleum Co. Ltd ...	707,458	2,106,649
Iraanse Aardolie Exploratie en Productie Mij	4,382,000	12,323,000
Kuwait Oil Co. Ltd	6,728,008	19,067,150
	Barrels	
Arabian American Oil Co. ...	36,435,281	110,419,968
Bahrain Petroleum Co. Ltd ...	1,399,135	4,101,851
Getty Oil Co. and American Independent Oil Co. (Kuwait-Saudi Arabia Neutral Zone) ...	3,968,836	11,500,534

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for March was 1,514,000 tons, the total for 1 January to 31 March being 4,149,000 tons.

Crude processed at Aramco's Ras Tanura refinery during March was 6,193,232 brl, the total for 1 January to 31 March being 19,192,872 brl.

Notes of the Month

Oil Shows in the Trucial Coast

Petroleum Development (Trucial Coast) Ltd reports that a well now drilling on a geophysical structure at Murban, some fifty miles to the south-west of the town of Abu Dhabi, has had several interesting shows of oil below 8400 ft.

Testing to evaluate these shows has just started and will take some weeks. Should the tests prove encouraging it will be necessary to carry out further work to determine whether there is oil in commercial quantities in the Murban structure.

Pipeline for Esso's Libyan Production

Esso Standard (Libya) Inc has chosen Marsa el Brega, on the Gulf of Sirte, as the site of a crude oil export terminal from its Zelten producing field, which lies approximately 100 miles to the south.

Actual work on the site awaits formal Libyan Government permission, but terminal tankage and 30 in pipe have already been ordered for delivery during mid-1960.

Esso Libya, exploration and producing affiliate of Standard Oil Company (New Jersey), is currently developing specifications for construction of this terminal and working on plans for a pipeline route and the design of other necessary facilities to be built at Marsa el Brega.

Esso Libya has completed five producing wells in its Zelten field in the Cyrenaica province, and is actively engaged in further delineation of the discovery.

Exploration in West Africa

A new stratigraphical test well has been started in Senegal, West Africa, for the Société des Pétroles du Senegal, in which the BP Group has a 50 per cent interest. This well, known as Nord Casamance No 1, is located in Senegal south of the Gambian frontier, about 40 miles from Zinguinchor.

Elsewhere in Senegal a BP Exploration party is carrying out a seismic reflection survey in an area to the north of Medina.

Nearby, in Gambia, a seismic survey is being conducted along the Gambia River by a contract party on behalf of BP and the French group BRP, who have each a 50 per cent interest in an exploration licence covering the territory.

BP is associated in plans to drill a further series of stratigraphic test wells in Senegal and Gambia. These will include a number of shallow holes in the Société des Pétroles du Senegal's new concession in the area to the east and south of Linguere, one on the Bathurst peninsula in Gambia, one to the north of Bathurst (in Senegal), and another in the extreme north-west of Senegal, near Louga.

Drilling Progress in Papua

Australasian Petroleum Company Pty Ltd reports that preparations for the drilling of Iehi No 1 well in Papua are proceeding satisfactorily. Two of the partners in APC—BP Exploration Co. and Oil Search Ltd—are participitating in the venture.

The construction of a helibase near Barikewa is nearing completion, and levelling of a sufficient area at the rig site to take the drilling outfit is also well advanced.

More than half of a two and a half mile pipeline has been laid through jungle-covered pinnacled and creviced limestone terrain between the Kikori River and rig site to provide water for drilling purposes.

Because of the difficult terrain this line has required the adoption of rather an unusual method of construction. It is being laid in approximately half-mile sections between helicopter clearings. The pipe lengths are landed and joined at one helicopter clearing and are hauled through with a hawser attachment by a powered winch located at an adjacent helicopter clearing.

North Sea Oil Drilling Next Year

The £500,000 mobile underwater oil-drilling platform *Triton*, the first of its kind to be completed on the Tyne, and only the second in Britain, is to operate next year in the North Sea.

The platform, at present at Cardiff, is to be used by the NV Nederlandse Aardolie Mij (NAM), in which company Bataafse Internationale Petroleum Mij (BIPM) and Standard Oil Co. (New Jersey) each have an equal interest.

After preparation, the *Triton* will make three drillings in 1961 off the coast of south Holland, the actual sites depending on the results of seismic exploration, begun last year and now in progress, of the deeper strata under the sea-bed.

The platform, 115 ft long and 80 ft wide, will also be equipped with NAM's most modern direct-current diesel-electric drilling rig, as well as with a helicopter landing deck.

Containing more than 1500 tons of steel, the platform was constructed according to specifications drawn up by BIPM, the main contract being carried out by De Long Ltd. Construction of the hull and legs was contracted out by De Long to Clelands, at their shipbuilding yard at Wallsend-on-Tyne.

New Shell Refinery for Canada

Shell Oil Company of Canada Ltd is considering the purchase of an industrial site south-east of Calgary as a possible location for a refinery. An option on the 310-acre tract of land was negotiated some time ago through J. C. Leslie and Company Ltd.

Shell was recently granted a development permit on the land by the Interim Development Board of the Municipal District of Rocky View, and the Company expects to begin a series of surveys and engineering studies, in due course.

The new refinery will manufacture automotive and domestic fuels for the Alberta market. Capacity of the plant will depend upon marketing developments between now and the time construction begins.

Shell's present manufacturing facilities in Canada include a refinery at Montreal East with a capacity of 62,000 bd and one at Burnaby, B.C., with a capacity of 22,000 bd. The Company also has a chemical plant adjacent to its Montreal East refinery, and a gas processing plant at Jumping Pound, Alberta, having a capacity of 90 million cu ft/day. Two sulphur extraction units operated in conjunction with the latter plant have a rated combined capacity of 80 long tons of elemental sulphur per day.

ICI Ammonia and Methanol Plants Expansion

ICI Ltd is to make large additions to its plants for manufacturing ammonia and methanol and for making products from ammonia.

A new ammonia plant with a capacity of 100,000 tons a year, and associated plants to make urea and fertilizers, will

be built at the Severnside works in south Gloucestershire, at a cost of upwards of £10 million. These plants are expected to start production during 1963.

The Group has also decided to extend the methanol plant at its Heysham works in Lancashire. A new plant to make 30,000 tons a year of methanol for the plastics industry began production there only a few months ago. A further extension to make an additional 45,000 tons per year is now to be built, and is expected to be completed during 1962.

New Esso Head Office

Esso Petroleum Company Ltd is to have a new head office. A long-term lease of a new building, already under construction, on an island site with a frontage of about 500 ft to Victoria Street, London, S.W.1, has been negotiated with The Land Securities Investment Trust Ltd.

A model of the proposed new building

The new headquarters of the Company, consisting of 235,000 sq ft of office accommodation, will be completed in two phases. The first phase, a 16-storey tower and a 9-storey west wing, is expected to be ready for occupation by autumn 1961, and will enable the majority of the head office staff to be re-housed by that time. The remaining 9-storey east wing will be completed by spring 1963.

The new building, which will have shops along its Victoria Street frontage, and car park facilities at the rear, will be faced with granite and Portland stone. It has been designed by Messrs T. P. Bennett & Son.

Messrs Knight Frank and Rutley acted for the owners, and the major portion of the site was acquired through Henry Joel and Company.

Changes in Membership Regulations

The regulations for admission to the classes of graduate and associate membership of The Institution of Chemical Engineers have recently been revised in part. The revisions are mainly concerned with the definition of qualifications which exempt completely or in part from the Institution examination. The new basis for complete exemption from the examination is the satisfactory completion of an honours degree course for a first degree in chemical engineering of a British university.

In addition, the new edition of the regulations incorporates the revised syllabus for the Engineering Drawing Examination, Paper D, which comes into force with the 1960 examination.

Any enquiries should be addressed to J. B. Brennan, general secretary, The Institution of Chemical Engineers, 16 Belgrave Square, London, S.W.1.

Cold Weather Fuel Tests in Lapland

The latest series of practical product service tests conducted by The British Petroleum Co., which studied the behaviour of a range of fuels under cold weather conditions, was organised recently at Lycksele, near the Arctic Circle, in Swedish Lapland.

A team of 10 technicians from the BP Research Centre at Sunbury, and from BP Technical Services Branches in London and Stockholm, were involved, and during their six weeks' stay completed some 200 tests.

The tests were carried out on the snow-covered Lycksele Racecourse where good track was available, and where suitable cold weather conditions could be expected to prevail. The tests required a low temperature—at Lycksele it falls as low as −31°F on occasions—and preferably one which changes from day to day.

The particular purpose of these tests was to try out in the field the results of recent research at Sunbury on the effect of low temperatures on diesel fuels.

Research workers at Sunbury began some time ago to attempt to devise reliable methods of testing, and the Lycksele experiments were designed to show how far the laboratory work was confirmed under practical driving conditions.

The vehicle fleet used for the tests included seven trucks of British, Swedish, and German make, and four tractors of British and German manufacture, as well as a number of other service vehicles.

As one of the problems of studying the cold weather operation of various vehicles is that the performance might differ quite considerably according to the type of filters used, their location on the vehicle, and other aspects of the fuel system, the fleet was carefully chosen to be representative of the most commonly-used systems. Comprehensive instrumentation of the vehicles provided an exact record of fuel behaviour during each test.

Several types of diesel fuel oils were tested and useful information was also obtained on the problem of the cold-starting of diesel engines. While the results of the tests have yet to be analysed, some of the information obtained will clearly be useful to vehicle manufacturers as well as to BP.

A Massey Ferguson tractor comes in for instrument readings after completing a lap of the track, whilst a Porsche tractor is driven away after finishing a test

New Thames Estuarial Tanker

Members of the technical press recently inspected the mv *Charmo*, a 500-tons capacity estuarial oil tanker, built by Charrington Gardner Locket (London) Ltd at their Dartford works for their own use. She was designed by the owners in collaboration with their consultants, Messrs Archibald W. Walker & Partners, of London.

The vessel will operate mainly between Mobil's Coryton refinery and Charringtons' Poplar depot: the paramount design factor was the ability to complete the river trip and

The mv Charmo pictured off Charrington's Poplar depot

cargo discharge in all normal weather in the course of one tide. Fully loaded the trip can be made at a speed of 8 knots.

Principal dimensions include an overall length of 163 ft 3 in, breadth of 32 ft 6 in, and a depth of 10 ft 6 in. Five hundred tons of fuel oil are carried on an 8 ft 6 in draft.

Control of the vessel is from a central wheelhouse with all-round visibility. Steering is by means of Vickers Armstrong hydraulic gear and remote engine operation by Bloc Tube controls.

The Mirrlees cargo discharge pumps have a capacity of 285 tons/hr, and are belt driven through clutches from either of the main engines. 12-in suction lines are provided to facilitate rapid unloading, and the position of the suction points close to the centre line of the vessel and the after ends of the cargo tanks, together with the slightly "V" section of the bottom, enables the fuel cargo to be cleared almost entirely without the need for stripping pumps. Heating coils are provided in the six cargo tanks, coupled to a 1 million Btu/hr Potterton hot water boiler. This will, however, only be needed in exceptional circumstances, as the coils are also coupled via a heat exchanger with the main engine water jackets, which, in practice, provide the necessary heat requirements while they are running.

The two EVSM4 Lister Blackstone engines provide 256 bhp at 600 rev/min, each on 6 hour rating, coupled to a $2\frac{1}{2}$: 1 oil-operated modern wheel drive reverse gear box, driving a single 4-bladed 6 ft 6 in diameter bronze screw.

A Lister Blackstone air-cooled diesel auxiliary of 33 hp drives a 10 Kw 100v dc generator, bilge pump, air compressor, and hydraulic pump. All auxiliary units are duplicated, the latter being driven by the main engines.

Gold Plating in Engine Research

Research engineers at the Thornton Research Centre of "Shell" Research Ltd are gold plating a piston from a car engine as part of their studies of basic problems concerned with combustion and lubrication for the design of fuels and lubricants required in the engine of the future.

Gold plating was used to study the deposits that form in the combustion zone where the mixture of fuel and air is burned, and which impair the performance of the engine. As compression ratios increase, the engine's tolerance for these deposits decreases, and there is therefore a possibility that these deposits may act as a limit to further increase in compression ratios.

The object of this work is to study the mechanics of the adhesion of the deposit. When deposits collect, they are held in place partly by chemical combination with the surface and partly because, due to the action of the hot gases, the surface becomes so pitted that deposits are physically "locked" in place. Since the precious metals like gold are less likely to be attached and pitted Thornton studied the deposit formation on the specially-plated piston.

While the results of this gold-plated experiment did not solve the problem of the adhesion of deposits, it contributed to an understanding of the problem by confirming that deposits are considerably less adherent to surfaces that are not susceptible to pitting.

New W. London Fuel Oil Terminal

Charringtons new fuel oil installation at Lion Wharf, Isleworth, is now in service. This terminal has been planned to meet the growing demand for fuel oil for central heating as well as for industry.

The terminal is river-fed from Coryton refinery and oil is transported in Charringtons' own barges and pumped into three storage tanks holding a total of 600,000 gallons.

Chemical Society Awards

Applications, nominations, or information are required during the current year for two awards to be made by The Chemical Society, Burlington House, London, W.1.

The first, the Corday-Morgan Medal and Prize for 1959, consisting of a silver medal and a monetary prize of 200 guineas, is made annually to the chemist of either sex and of British nationality who, in the judgment of the council of the Chemical Society, has published during the year in question the most meritorious contribution to experimental chemistry, and who has not, at the date of publication, reached the age of 36 years. Copies of the rules governing the award are obtainable from the General Secretary of the Society.

The Harrison Memorial Prize, consisting of a bronze plaque and a monetary payment of 100 guineas, will be awarded to the chemist of either sex and of British birth who, in the opinion of the selection committee, has conducted the most meritorious and promising original investigations in a scientific periodical during the five years ending 1 December 1959. The applicant should not have been more than 30 years of age at the time at which the work occurred. Further information is obtainable from the President of the Society before 1 September 1960.

CJB Scholarships

Constructors John Brown Ltd has entered into an agreement with The Institution of Chemical Engineers for the award of two scholarships. The purpose of the scholarships is to encourage research in chemical engineering and, in particular, in chemical plant design.

The scholarships, which are each of a maximum value of £500 per annum, are tenable at any educational institution in the United Kingdom in receipt of grants from the University Grants Committee, and having a department of chemical engineering under the direction of a professor of chemical engineering.

Further particulars may be obtained from Dr J. B. Brennan, General Secretary, The Institution of Chemical Engineers, 16 Belgrave Square, London, S.W.1.

Applications should reach the Institution before the end of June.

U.K. Oil Consumption Increase of 17 Per Cent in 1959

Consumption of petroleum products in the U.K. in 1959, excluding foreign bunkers, rose by 17½ per cent compared with 1958 to a figure of 36,514,044 tons, according to the Petroleum Industry Advisory Committee statistics just published by the Petroleum Information Bureau. Total consumption in 1958 was 31,065,629 tons.

With regard to individual products, fuel oil once again showed the largest increase in usage. At a 1959 level of 13,811,874 tons (excluding refinery usage), the total was nearly one-third higher than that for the previous year. Its use for central heating, steam raising (including public electricity generation), in the glass and ceramics industries, and in gas making and other manufacturing especially, increased particularly rapidly. Consumption of fuel oil decreased in agricultural driers and heaters and in agricultural power units.

As in other recent years, the most notable overall increase in the use of black oils by any end use sector was in the sphere of steam raising in public electricity generating stations; the total for 1959 of 4,154,203 tons being a rise of 1,518,772 tons, or 58 per cent, over the previous year.

Deliveries of gas/diesel oil, at 3,123,477 tons, were up by 4·6 per cent. End use sectors showing notable increases in use included central heating, marine craft, rail traction, and mobile diesel engines. Usage of this product in gasworks declined however, as it is being replaced by light distillate feedstock and petroleum gases.

Motor spirit consumption showed an increase of 7·5 per cent in 1959 over the preceding year, totalling 7,123,569 tons. Demand for premier grades continued to increase, being 16 per cent up in the year under review, and that for standard grades declined. Total consumption by commercial consumers was down by 46,741 tons, or 3 per cent, due to the growing preference for diesel-engined vehicles. The use of derv fuel increased by 11 per cent to 2,275,803 tons.

Consumption of burning oil rose by 7 per cent to 1,203,118 tons in spite of the fact that 1959 had the highest average temperature recorded for many years. The trend in the decline in use of vaporizing oil continues as more and more diesel tractors are introduced, the drop being 17 per cent compared to 1958.

The decline in aviation fuel consumption due to the increasing use of jet propulsion was arrested in 1959, the figure of 1,628,425 tons being an increase of 63,419 tons. The former total, however, still showed a drop of 1381 tons compared with 1957.

TABLE 1

U.K. DELIVERIES INTO INLAND CONSUMPTION OF PETROLEUM PRODUCTS

(in tons)

	1938	1948	1953	1956	1959
Aviation fuels (a)	112,549	343,268	1,184,000	1,753,996	1,628,425
Motor spirit (incl. motor benzole)					
Dealers:					
Premier grades	2,790,326	2,671,298	2,197,254	2,929,191	4,050,555
Standard grades			1,578,260	1,541,070	1,576,127
Commercial consumers:					
Premier grades	2,040,000	1,593,647	255,378	336,289	404,705
Standard grades			1,709,063	1,517,104	1,092,182
	4,830,326	4,264,945	5,739,955	6,323,654	7,123,569
Industrial spirits (incl. industrial benzole)	38,366	66,104	100,917	148,071	207,123
White spirit	72,057	142,119	140,998	155,593	156,073
Kerosine:					
Burning oil	543,000	558,000	546,708	830,808	1,203,118
Vaporizing oil	177,676	811,473	833,051	574,175	369,169
	720,676	1,369,473	1,379,759	1,404,983	1,572,287
Derv fuel	387,059	816,726	1,270,773	1,797,139	1,275,803
Gas, diesel, and fuel oils:					
Gas/diesel oil	797,000	1,367,556	1,717,175	2,387,490	3,123,477
Fuel oil	628,000	2,741,675	3,815,290	6,471,209	13,811,874
Refinery consumption ...	183,000	422,179	1,508,491	2,157,170	3,078,518
	1,608,000	4,531,410	7,040,956	11,015,869	20,013,869
Lubricating oils and greases ...	564,000	653,000	794,238	894,499	927,670
Paraffin wax and scale	48,121	42,739	40,053	52,335	51,370
Propane and butane	2,400	19,300	53,164	68,395	125,252
Bitumen	607,132	492,941	749,526	940,934	990,927
Other products (b)	—	24,000	508,356	667,581	1,441,676
TOTAL	8,990,686	12,766,025	19,002,695	25,223,049	36,514,044

(a) From 1948 includes aviation turbine fuel.

(b) Mainly feedstock for petroleum chemical plants.

TABLE II

ESTIMATED END USE OF CERTAIN PETROLEUM PRODUCTS

(*in thousand tons*)

	1954	1956	1959
Motor spirit:			
Cars and motor cycles	2,700	3,140	4,212
Taxis	80	50	27
Public service vehicles	140	120	85
Goods vehicles	2,160	2,200	2,050
Industrial use	190	190	210
Agricultural use (incl. vans)	260	245	220
Services and other government	335	325	280
Petroleum industry own use	28	27	18
Miscellaneous	29	27	22
	5,922	6,324	7,124
Derv fuel:			
Public service vehicles	850	845	832
Goods vehicles	525	907	1,389
Petroleum industry own use	23	24	33
Miscellaneous	15	21	22
	1,413	1,797	2,276
Burning oil:			
Farming	37	20	16
Industrial and railways	57	49	43
Services and other government	55	51	40
Domestic heating, lighting, and cooking	455	711	1,104
	604	831	1,203
Vaporizing oil:			
Agricultural tractors	655	535	342
Agricultural stationary engines	18	14	8
Fishing	14	8	5
Industrial	20	17	14
	707	574	369
Lubricating oil and greases:			
Aviation	—	12	9
Industrial	—	491	500
Marine	—	68	80
Motor	—	277	295
Tractor	—	46	44
	—	894	928

TABLE III

UNITED KINGDOM

INDIGENOUS MATERIALS MADE AVAILABLE FOR DISTRIBUTION BY THE PETROLEUM INDUSTRY

(excl. Shale and Indigenous Crude)

(*in tons*)

	1959	1958
Motor spirit (by low-temperature carbonization)	5,638	6,015
Motor and aviation spirit (by hydrogenation)	—	49,456
Refined benzole	265,023	306,038

The Last Twenty Years

In addition to the aforementioned annual PIAC booklet published by the Petroleum Information Bureau, an extremely interesting review of U.K. oil demand and refinery production over the last 20 years has been issued by the Bureau. The accompanying statistical tables are obtained from these two sources; the figures relating to 1959 are available from the PIAC booklet and those for other years are derived from statistics issued by the Petroleum Information Bureau.

It can be seen from Table I that total consumption of petroleum products in the U.K. has risen from 8,990,686 tons in 1938 to a figure of over 36·5 million tons twenty years later. Since as recently as 1948, total demand has risen by almost 190 per cent—close to a three-fold increase.

Within these totals the meteoric climb in the use of black oils is obviously the most outstanding factor. This can be seen to have risen from 1,608,000 tons in 1938, reached 4,531,410 tons ten years later, and to have then multiplied by well over four times to the present level of over 20 million tons. A study of Table V presents some interesting data on the part played in these increases by the various sectors of end use.

The output of refined petroleum products in the U.K. last year of 39,136,237 tons can be compared with the 2,391,722 tons produced in 1938, and the 1948 total of 4,461,567 tons—an indication of the greatly increased number and size of refineries in Britain over the last twenty years. Details of individual products can be seen in Table IV.

TABLE IV

UNITED KINGDOM

PRODUCTION OF PETROLEUM PRODUCTS EX IMPORTED AND INDIGENOUS CRUDE AND PROCESS OILS (incl. SHALE)

(*in tons*)

	1938	1948	1953	1956	1959
Motor and aviation spirit	316,531	610,802	6,243,355	6,771,195	7,531,348
Industrial spirits	2,585	3,950	2,384	2,291	1,674
White spirit	27,181	43,028	45,126	133,926	139,457
Burning oil	121,036	110,508	472,971	771,330	1,601,326
Vaporizing oil	6,337	10,337	80,334	98,037	171,414
Gas/diesel oil	377,537	907,229	4,303,935	5,188,849	7,240,974
Fuel oil	454,402	1,396,626	10,747,120	10,394,848	15,598,630
Refinery fuel consumption (ex own production)	190,000	337,244	1,494,646	2,130,906	3,032,084
Bitumen	612,609	523,227	715,887	933,432	961,248
Paraffin wax, scale, and slack wax	11,843	14,124	15,217	19,326	30,522
Lubricating oil	157,805	365,831	365,891	776,385	863,284
Propane and butane	1,600	15,038	48,309	66,260	125,897
Miscellaneous products and loss	112,256	123,623	860,784	1,394,478	1,838,379
TOTAL	2,391,722	4,461,567	25,395,959	28,681,263	39,136,237

TABLE V

UNITED KINGDOM

INLAND END USE OF GAS OIL, DIESEL OIL, AND FUEL OIL

(in tons)

	1938	1948	1953	1956	1959		
					Gas diesel	*Fuel oil*	*Total*
Burning:							
Central heating:							
Private houses	20,000	24,900	38,543	94,398	161,098	7,528	168,626
Other premises	225,000	228,985	433,302	1,080,892	402,165	1,804,868	2,207,033
Bakeries	65,000	61,146	69,848	107,131	23,357	107,310	130,667
Glass	91,000	205,936	175,879	261,712	20,006	320,847	340,853
Ceramics (a)	—	—	46,172	89,900	10,217	155,925	166,142
Steel manufacture:							
Open hearth	—	544,907	782,284	1,066,941	1,608	1,303,137	1,304,745
Other	—	256,958	439,400	605,802	60,374	654,407	714,781
Industrial furnaces:							
Metallurgical	325,000	227,651	281,406	376,036	58,778	311,367	370,145
Other	55,000	103,564	195,028	275,395	115,663	308,521	424,184
Agricultural driers and heaters (b)	—	—	70,531	72,710	41,700	22,316	64,016
Steam Raising:							
Public elec. generation	103,000	979,919	1,018,452	358,650	16,849	4,137,354	4,154,203
Other				1,826,105	67,437	3,454,329	3,521,766
Power:							
Agricultural power units	6,000	36,481	123,827	360,254	516,222	4	516,226
Marine craft	65,000	251,006	556,458	790,100	287,242	689,153	976,395
Rail traction:							
Railways	7,000	47,407	12,839	18,241	137,746	3,093	140,839
Industrial		10,438	17,299	21,507	24,187	180	24,367
Stationary oil engines:							
Public electricity supply	17,000	40,055	63,886	60,673	36,843	24,345	61,188
Other	196,000	224,323	285,142	327,464	343,632	8,058	351,690
Mobile diesel engines	43,000	167,361	270,881	346,057	378,700	19,608	398,308
Manufacture:							
Gas making	130,000	469,798	453,982	462,556	360,845	158,674	519,519
Other manufacturing	32,000	47,642	48,838	82,670	35,669	154,546	190,215
Refineries (d)	218,000	422,179	1,508,491	2,157,170	—	3,078,518	3,078,518
Petroleum industry		105,259	148,468	173,505	12,139	166,304	189,443
Government (c)	10,000	75,495	—	—	—	—	—
Total Deliveries	1,608,000	4,531,410	7,040,956	11,015,869	3,123,477	16,890,392	20,013,869

(a) Included under "Other manufacture" before 1951.
(b) Included under "Steam raising—other" before 1951.
(c) Included under appropriate consumption categories after 1950.
(d) Including ex own production.

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BRITISH STANDARD FOR SAFE OIL HEATERS

Kerosine (paraffin) unflued space heaters, cooking, and boiling appliances for domestic use.

The eagerly-awaited new British Standard for oil heaters, BS 3300, is now available. It is a comprehensive technical specification covering all kinds of domestic kerosine appliances, including the radiant drip-feed heaters which have been under severe attack recently. In this British Standard manufacturers have the technical guidance they need to produce heaters with a very high safety factor, and it is expected that all heaters made from now on will comply with it.

The new standard supersedes the one issued in 1953 as BS 2049, Part 1, and its main feature is the inclusion of a really severe draught test. Tests will have to be made by manufacturers—with the aid of a wind-tunnel—to ensure that heaters will not create a fire hazard even when exposed to draughts up to as strong as 26 ft sec, that is 17–18 mph. This figure was recommended by the DSIR in its recent report.

The standard also includes a requirement to limit as much as practicable the hazard which might result should an appliance be knocked over. It is laid down that all heaters must include some provision for fixing them to the floor or wall to prevent overturning, and the fuel tanks of radiant heaters must also be made of corrosion-resistant materials because a fuel tank that corrodes is a potential fire risk.

The standard says that a *permanent* label fixed to each heater shall give the manufacturer's name or trade mark and the number of the British Standard. The label will also warn against carrying a heater when alight, on the need for adequate ventilation, on protection from draughts, against the use of motor spirit, and against placing the appliance where it can be knocked over.

It is hoped that many manufacturers of oil heaters will obtain a licence from BSI to label their products with the Kite-mark as an assurance to the public that samples have been independently tested and approved in the BSI's own laboratories.

Copies of the standard are obtainable from BSI's Sales Branch, 2 Park Street, London, W.1, price 10*s*, (postage extra to non-subscribers).

Automatic Control at a Distribution Installation

The Shell-Mex and B.P. Ltd installation at Royston, Hertfordshire, was opened on 26 October 1959, and is said to be the most modern of its kind in the United Kingdom.

The depot is the first to operate without the necessity of any work being done in the tank compound. This is achieved by means of the closest control of the quality and movement of products, from the offloading by rail tank cars into storage tanks, to the loading of road vehicles at the gantries. Switchboard control of all operations is effected from within the depot manager's office itself, an important innovation. A flowsheet diagram of all operations within the depot is incorporated in the control panel, and includes signal lights which indicate the state of each valve and pump. In addition to providing automatic indication of the quantity and temperature of the contents of the storage tanks, it embodies facilities for opening and closing the inlet and outlet master valves on each tank at the touch of a button. The manager thus has a complete picture of the depot operations constantly in front of him, enabling the whole question of stock control to be done from within the office.

In the design of the six-acre site the lie of the land was particularly utilized to achieve economies in manual work and vehicle movement in the course of daily operations. The rail tank sidings are at a higher level than the storage tanks which are in turn at a higher level than the pumps for the loading gantries.

The depot is supplied by rail cars, two trains a day bringing a total input of 600 tons/day. The rail car off-loading gantry can accommodate a complete train of 26 rail cars. A total of ten products enter the depot at this point—seven spirit brands or grades, gas oil, derv fuel, and light fuel oil (220 Redwood I at 100 sec). The pumps for the input of supplies at the railhead are four 40 tons/hour Stothert and Pitt screw displacement pumps.

A control panel at the discharge position can open or close all the tank inlet valves, but is subject to overriding control from the master panel in the manager's office. All remote control of valves is done by means of Buxton-certified flame-proof equipment.

The automatic controls of the 6 in Audley cast steel storage tank valves are in the form of air-operated actuators with solenoid control. The ten tanks have a total capacity of 3500 tons (about 1 million gallons), and each is equipped with Evershed and Vignoles automatic dip and temperature recording devices with remote indicators in the office.

The automatic dipping devices are operated by means of a displacer partly immersed in the liquid and suspended from a winding drum which is connected to a two-phase induction reversing motor. On any change in the liquid level the motor rotates in the direction required to maintain the displacer at a constant height in relation to the surface of the liquid.

The average temperature device, which is suitable for temperatures of 0-100°C, is in the form of a resistance thermometer consisting of a high temperature coefficient nickel wire wound in the form of a helical spring and encased in a nylon tube extending throughout the depth of the liquid between an anchor plate on the tank bottom and a float on the surface of the liquid.

Each tank is of the fixed roof variety, and anti-fire spray devices are fitted to the top of each of the spirit tanks.

Suction lines from the storage tanks run to the pump platform where products are pumped through separate underground lines for each product to the road vehicle filling gantries. The pumps employed in this section consist of two 20-ton strippers, twelve 50-ton centrifugal pumps, and two 60-ton screw pumps for light fuel oil. The steam lines in the pumps have a manufactured pressure of 150 psi, although the actual operating pressure is 80 psi.

The covered vehicle loading gantries are positioned centrally so that road vehicles are able to drive in and out without reversing. Eight road vehicles of up to 4000 gal capacity may be filled simultaneously. The gantries, which employ fluorescent light in place of spotlights, are equipped with standard type loading arms and electrically-driven pumps load at a rate of 250 gal/min through each point. Each loading assembly embodies a positive displacement meter with pre-set quantity control. The recording heads are of the fully-swivelling type and are equipped with ticket printing meters, whilst all pumps are remotely controlled from the racks. Loading operations are thereby carried out without the employment of any operational staff other than the drivers of the vehicles.

Lubricating oil supplies are brought to the Royston depot by road from Lensbury Wharf, and are stored in two 12,000-gal, 9 × 30-ft tanks. Each tank contains six separate grades and supplies are withdrawn by means of gravity load.

Supplies of light fuel oil for the use of the installation itself are obtained from the depot's storage and are contained in a 600-gal service tank for the provision of hot water and heating.

Vehicle servicing facilities, including cleaning, greasing, inspection, and repair are housed in a separate building close to the loading gantries. For the first time in any depot the vehicle washing bay is equipped with top, side, and bottom lighting.

The two-storey administrative building contains the installation's operations centre on the ground floor and the Shell-Mex and B.P. branch office on the first floor. Total staff of the depot, including sales personnel, is about 45.

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LIBRARY SHORTAGES

The Institute library finds itself short of certain periodicals which are required to complete sets for binding. The missing parts are listed below and the Librarian will be grateful to hear from any member having spare copies for disposal.

Brennstoff-Chemie	Band 39, no. 19/20. 1958.
Drilling	Vol. 19, nos. 1 and 2. 1958.
L'Industrie du Pétrole ...	No. 9. 1958.
National Petroleum News ...	Vol. 51, no. 2. 1959.
La Revue Pétroliere	August 1956, March and August-September 1957.
World Oil	January-June 1958.
International Petroleum Trade	Vol. 27, no. 6. 1958.
AIME Petroleum Transactions	1942-1949 inclusive.

BIRMINGHAM STUDENTS DINNER

The toast of "The City of Birmingham" was proposed by Professor F. H. Garner and responded to by the Lord Mayor, Alderman J. H. Lewis

Thirteen is obviously not an unlucky number, for attendance at the thirteenth Annual Dinner of the Birmingham University Chemical Engineering Society and Student Section of the Institute of Petroleum established a new record with an attendance of over 200 members and guests. Held on 27 April in the Guild of Undergraduates' Union of the University, it was presided over by K. Masters, chairman of the Society, and the guests included representatives of the petroleum and the chemical industries. Guest of honour was the Lord Mayor of Birmingham, Alderman J. H. Lewis.

After a well-chosen and satisfying dinner, the assembled company sat back in their seats to listen to a few satisfying speeches from well-chosen speakers.

A. R. W. Large proposing the health of "The Guests" and S. F. Burman expressing the thanks of the guests for their entertainment

The City of Birmingham

Proposing the toast of "The City of Birmingham", Professor F. H. Garner, O.B.E., president of the Society, first welcomed the Lord Mayor and took the opportunity of expressing the students' gratitude to the City for all it was doing for them.

Birmingham, said Professor Garner, was an old city, and during its history had made many contributions to industry. For example, it was in Birmingham that sulphuric acid was first manufactured in lead chambers. That was indeed a very early example of chemical engineering, and marked the transition from glass to metal apparatus.

Birmingham was also a city of independent souls, he said, and had made many valuable contributions also to the arts. Thus, some of the finest brasswork of the Adam period had been made in the city. Birmingham had also made a noteworthy contribution to the printing art, and Baskerville's name would always be remembered in this connexion.

Referring to the manorial history of the city, Hutton, the earliest Birmingham historian, relates that a committee was responsible for looking after the waste ground in the town and ensuring that it was put to good use. Records showed that the committee met only once a year for a generous dinner. On those occasions it was considered that until the table was well stacked with bottles it was too early to commence business. Thereafter it was too late.

Birmingham had been a pioneer in technical education, and as early as 1789 had courses and advanced lectures for the training of artisans or technicians. These courses were probably inspired by the Lunar Society, of which Priestley and others were leading members.

The Lord Mayor, responding to the toast, said that the Chemical Engineering Depart-

"The Society" toast was proposed by Professor T. H. B. Spencer and acknowledged by K. Masters

ment was "the most important department of the most important red-brick university in the country."

The City of Birmingham was noted for its large number of industries, and set a standard for industry which was recognized throughout the world. The city owed much to its university, which had been sponsored by Joseph Chamberlain. He understood that of the Department's 100 graduates and 250 undergraduates, a large number came from other parts of Britain. That in itself was a tribute to the high standing of the Department and of the University.

The ramifications of education in Birmingham were unexcelled, he said, and many came there to learn the crafts and skills which had made the City great.

The Guests

Proposing the health of their guests, A. R. W. Large, junior treasurer of the Society, said that the students were quite naive about industry, although they all realized that one day they would have to go into industry. They did make some acquaintance with industry during their vacation courses, and were indeed grateful to their guests from industry who had accepted their invitation to be present that evening. Their presence gave the students an opportunity to meet those people and to hear something about the industries which they represented.

On behalf of the guests, S. F. Burman, C.B.E., Pro-Chancellor of the University, expressed their thanks for a delightful evening in the company of the most mature of all the societies in the University.

The Society

Professor T. H. B. Spencer, Professor of English at the University, expressed his pleasure at being called upon to propose the toast of "The Society".

He said that it was a little sad that this year they would be bidding farewell to Professor Garner—a great scholar and a great scientist.

The chairman of the Society, K. Masters, said that the past year was one which would long be remembered and was one which had been very satisfactory. He then detailed social and sporting events in which, in varying degrees and with varying results, the Society had participated during the year.

The Society was in a healthy state, he said, and they were particularly happy to have their president, Professor Garner, with them that evening. Much had been said in his honour, and to him the Society and the Department owed much.

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RESEARCH IN INDUSTRY ESSAYS

The Scientific Advisory Board of *Research* is once again sponsoring the annual Waverley Gold Medal essay competition, which is designed to encourage the scientist and the engineer to express his views and translate his work into an essay that will be readily understood by all those interested in science and technology.

The Gold Medal, together with £100, will be awarded for the best essay of about 3000 words describing a new scientific project or practical development; giving an outline of the scientific background, the experimental results, and the potential application of the project or process in industry. A second prize will be awarded, together with one for the best entry from a competitor under the age of 30 on 31 July 1960.

In addition, *Research* is introducing an additional competition the purpose of which is to draw attention to the difference between a purely scientific solution and a practical, commercially-viable project. Candidates, who must be practising scientists under the age of 30, are invited to write an essay of some 5000 words on the subject of any new idea, concept, or experimental result put forward in the recognized scientific literature over the last two years, and discuss the commercial exploitation in the next decade.

Entries for either of these competitions must be posted to reach The Editor of *Research*, 4–5 Bell Yard, London, W.C.2, not later than **31 July 1960.** They will be acknowledged only if a stamped addressed envelope is enclosed.

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ESSO PETROLEUM OPERATIONS IN 1959

The 1959 issue of Esso Petroleum Company's *Annual Review* is probably the most ambitious and impressive that the Company has yet produced.

In addition to the usual review of Company operations during the year by the board of directors, and the outline of income and expenditure and trading results—always presented with admirable clarity—the main body of the report is given over to a pictorial impression of many of Esso's operations in 1959.

This selection of photographs, with a greater reliance on colour than hitherto, gives the reader a glimpse of the many-sided operations of the Company. Product research, marketing, the applications of the various automotive fuels, refinery and terminal construction at Milford Haven, developments at Fawley, and life on a tanker are all depicted, together with an innovation—a mention of the search for and the discovery of the crude oil which is the origin of the Company's operations.

The volume of sales, including exports, achieved by the Company during the year was a new record level of 16 per cent above the figure for 1958. The most substantial increase was in fuel oil, but in addition the increasing use of jet aircraft was reflected in the sales of turbo jet fuels. The exceptionally fine summer also greatly helped motor spirit consumption.

With Esso's increased participation in the supply of feedstocks to the chemical industry, butadiene supplies were piped from Fawley to the neighbouring International Synthetic Rubber plant, and ethylene for the production of polyethylene was supplied in large quantities to Monsanto, ICI, and other companies. Supplies will also be sent to Union Carbide Ltd during 1960.

Total trading receipts in 1959 of £292,039,000 were more than £32 million up on the previous year, and the Company's net profit after tax rose by £2 million to £10,942,000. This level of profit actually represented a slightly lower return on investment than the average during the last five years.

During the year £28 million was spent on capital investment in the market, making £154 million invested over the last ten years in new ships, refinery plant, and marketing facilities.

Additions to refinery plant and equipment cost in 1959 approximately £11,500,000, of which £7,500,000 was spent on refinery construction at Milford Haven. Expenditures on additions to the tanker fleet, including instalments on new vessels, totalled nearly £9 million; and over £7,500,000 was invested in new marketing installations and facilities. As the *Annual Review* comments, "a year of good, solid progress".

Books and Films

Maps of Far East Oil Symposium Report

The November 1959 issue of the *IP Review* discussed the oil symposium held in December 1958 under the organization of the United Nations Economic Commission for Asia and the Far East (ECAFE), and reviewed the report of the symposium which was published under the title *Proceedings of the Symposium on the Development of Petroleum Resources of Asia and the Far East*.

The United Nations has now published an annex to this valuable report which consists of 72 figures for the documents included therein. It includes tables of world energy production, refinery output and capacity, and movements of petroleum by sea, but the main section of the annex presents maps and graphs of exploration activity, producing oilfields, and geological structures in some countries outside Asia in addition to all of the regions having oil production or potential within that continent.

The publication, which is an accumulation of important oil maps of a kind which is rarely available together in published sources, is obtainable in the U.K. from HMSO, price 7*s*.

Mining Developments in Asia

The 1957 edition of the United Nations publication *Mining Developments in Asia and the Far East* is the seventh in the series, and contains information obtained largely from government sources.

The first section is a general survey of the ECAFE region, and this is followed by a more detailed country-by-country analysis, supplemented by a wealth of statistical data.

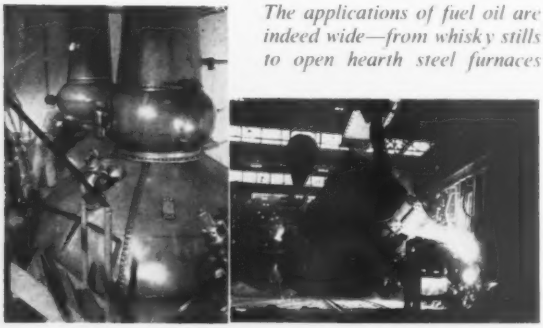
Although the publication is mainly concerned with metals and ores a short review of the petroleum situation in each of the relevant countries is given.

Copies are obtainable in the U.K. from HMSO, price 5*s*.

"The Advancing Flame"

The latest film produced by The British Petroleum Company illustrates in a striking manner the growing and varied uses of liquid fuel and indicates trends in the constant research and development work in the field of combustion.

The advantages of fuel oil are shown in a series of shots taken in industrial establishments in Britain and on the Continent. The industries in which oil fuel is seen in use include the distillation of whisky, the making of bread, of bricks, of steel, of milk products, in the generation of electricity, and in the home for space and water heating.



The applications of fuel oil are indeed wide—from whisky stills to open hearth steel furnaces

On the research side some of the work illustrated shows flame investigations and boiler tests at the Company's Sunbury Research Centre, and also at the International Flame Research Laboratory at Ijmuiden.

Running time is 20 minutes.

British Standards

Petroleum Industry Valves

Five key standards for valves for the petroleum industry which specify ratings, design, materials, dimensions, tests, and marking requirements have been revised by the BSI.

BS 1414: cast or forged steel rising-stem, outside screw-and-yoke solid wedge gate valves with internal flanges and with butt-welding ends. Classes 150, 300, 400, 600, 900, 1500, and 2500. Nominal sizes, 1–24 in.

BS 1570: cast or forged steel lubricated and non-lubricated plug valves having straight-way ports, with integral flanges and butt-welding ends. Classes 150, 300, 400, 600, 900, 1500, and 2500. Nominal sizes, 1–24 in.

BS 1735: flanged cast-iron valves of the wedge gate and double disk gate types, with either outside-screw-and-yoke, rising-stem, or inside-screw, non-rising stem. Classes 125 and 250. Nominal sizes, $1\frac{1}{2}$–24 in.

BS 1868: cast or forged steel check valves of the swing, piston, and ball types. Classes 150, 300, 400, 600, 900, 1500, and 2500. Nominal sizes, 1–18 in.

BS 1873: cast or forged steel outside-screw-and-yoke type globe valves, with internal flanges and with ball or plug type disks. Classes 150, 300, 400, 600, 900, and 1500. Nominal sizes, $\frac{3}{4}$–8 in.

Copies may be obtained from the BSI Sales Branch, 2 Park Street, London, W.1. BS 1735 is price 12*s* 6*d*, the others 15*s* each, (postage extra to non-subscribers).

Microchemical Apparatus

Revisions have been published of Parts B2, D3, and H1 of BS 1428, "Microchemical apparatus".

Price of Part D3 is 4*s* and of the other parts 3*s*, postage extra to non-subscribers.

Procedures for obtaining properties of steel at elevated temperatures. Part 2: Rupture strength

BS 3228: 1960, forms part of a series of procedures for obtaining the data necessary to determine the properties of steel at elevated temperatures. Price is 3*s*, postage extra.

Test Methods for bitumen

The new standard BS 3235: 1960, contains eleven authoritative general methods of testing bitumen suitable for the specification of bitumen-containing compositions used in the building, road engineering, and electrical industries.

The issue of this standard sees the collection in one volume of most of the test methods applicable to the various bitumen-using industries. The exceptions are special methods for particular types of composition which are described in the standards themselves.

The methods, which are technically identical with the corresponding methods of the Institute of Petroleum, are for the determination of ash; ductility; flash point (open) and fire point, using Cleveland apparatus; flash point (open) and fire point using Pensky-Martens apparatus; fluxing value of flux oil; loss on heating bitumen and flux oil; penetration;

softening point (ring and ball); solubility in carbon disulphide: viscosity of cutback bitumen and road oil; water content (Dean and Stark method).

Copies may be obtained from the BSI, price 8*s* 6*d*. (postage extra to non-subscribers).

Translations of Russian Welding Journals

Under a scheme sponsored by the DSIR, the British Welding Research Association are publishing English translations of two important Russian welding journals.

The publications in question, *Avtomaticheskaya Svarka* and *Svarochnoe Proizvodstvo*, are particularly concerned with the aims and results of the intensive drive towards welding industry mechanization and automation in the U.S.S.R.

The translations of the two monthly journals are entitled *Automatic Welding* and *Welding Production*, and are available at an annual subscription of £10 10*s* and £5 respectively from the Publications Department, BWRA, Abington, Cambridge.

Netherlands Oil Equipment Catalogue

Details of the products and services supplied by the many companies engaged in the manufacture of petroleum equipment in the Netherlands are presented in the 1960 edition of the *Netherlands Oil Equipment Manufacturers' Catalogue*, published in English.

A classified index itemizes the various companies producing the vast range of equipment, and information on each individual company and its range of products and services is given with the aid of technical data and illustrations. A final section gives a comprehensive list of conversion tables, presented alphabetically, for a wide range of countries.

The *Catalogue* is obtainable from the Netherlands Oil Equipment Manufacturers, Nassaulaan 13, The Hague, Holland.

"Basic Electronics"

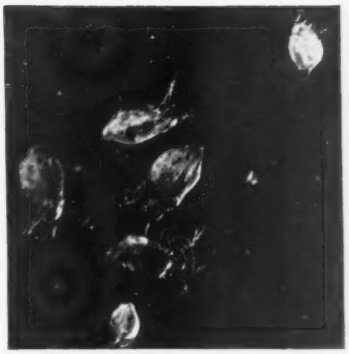
A complete training manual in six parts, averaging 100 pages each and many more times that number of easily-understood diagrams, is the best brief description of *Basic Electronics*, recently made available in Britain by The Technical Press Ltd. Like the first part of the complete course *Basic Electricity–Basic Electronics*, which was published in Britain about a year ago, these volumes are the basis of a training course for technicians as developed by the New York management consultants and graphiological engineers, Van Valkenburgh, Nooger & Neville Inc. The present volumes have been adapted to British usage by a special team of REME.

Basis of the training technique on which the course is designed is to present only the essential facts of each theory or piece of equipment. These facts are then explained simply and without extraneous matter which might confuse the understanding. To this end cartoon-type drawings are lavishly employed and add considerably to the ease with which technical and operational detail is assimilated. The first of the six parts is devoted to power supplies and rectifiers, the next two to amplifiers and oscillators, parts four and five to transmitters and receivers, and the final part to frequency modulation and transistors.

A noteworthy feature is the absence of all but essential formulae. Although originally developed for Service usage, the revised versions should be invaluable for the training of technicians in the civilian field. Price of each part is 12*s* 6*d*. or the complete set of six parts £3 6*s*. They are obtainable from The Technical Press Ltd, 1 Justice Walk, London, S.W.3.

"Unseen Enemies"

The Shell International Petroleum Company are to be commended on their latest contribution to the well-being of humanity by directing attention to the terrifying effects of the infectious diseases which attack mankind. Many of these diseases are caused by bacteria and viruses, and often they are carried by insects. Diseases flourish in conditions of squalor and dirt, in over-crowded dwellings, and in polluted water or atmosphere. *Unseen Enemies* points the way to the eventual eradication of disease and misery by the removal of the adverse conditions and by the use of chemicals to destroy the insects. The use of medical means such as vaccination and the use of biotics is also illustrated, and the effects of such treatment are shown.



Pond protozoa seen beneath the interference microscope in the film Unseen Enemies

To provide material for this film the Shell Film Unit covered between 40 and 50 thousand miles in some sixteen countries. Throughout they had the support of the World Health Organization and much local co-operation. Produced in Eastman Colour and running for 31½ minutes, it is being translated into nineteen languages and will be distributed in forty-five countries. It is macabre in parts, but only to give emphasis to the urgent need for measures to be increased in the effort to improve the lot of those who are suffering to an appalling degree.

The Unit is to be congratulated on the production of this film, the technical standard of which is a fine tribute to the skill of the cameraman, Sidney Beadle.

ILO Petroleum Committee Report

A report prepared by the International Labour Organization for the Sixth Session of the ILO's Petroleum Committee discusses developments in the petroleum industry since the last session of the Committee in 1955–6.

The rising level of world oil production and crude refinery capacity is reviewed. Future production prospects of the Sahara are analysed, with a description of the problems of working conditions in that area. Post-war trends in the locating of refineries are mentioned: the location in the consuming area, the building of plants far inland in Western Europe, and the growing tendency towards large refineries. A brief analysis is also given of the development of natural gas production.

A large part of the report is concerned with social problems within the industry, such as termination of contracts of employment, paid holidays, and housing, and some of the measures operating in various countries are examined.

The Sixth Session of the Petroleum Committee was held in Geneva on 25 April–6 May this year. Items on the agenda which were discussed included an examination of the general report; trade union organization in the petroleum industry; and practices, procedures, and techniques of effective employer–employee communications in the petroleum industry.

Lectures, Courses, and Conferences

International Clean Air Conference Proceedings

The proceedings of the International Clean Air Conference, held in London in October 1959, were published recently.

The 78 papers presented for discussion were contributed by authors from 17 different countries, the subject being sub-divided as follows: national air pollution problems, legislation, education, etc. (20 papers); technical problems (19); observations, investigation, and measurement of air pollution (18); research and international co-operation (21). The full list of papers and authors is given in the special booklet *Abstracts of Papers to the International Clean Air Conference* 1959.

The volume of the proceedings costs £1 10*s* per copy, plus 2*s* 6*d* for packing, postage, or carriage.

Order forms are obtainable from the National Society for Clean Air, Palace Chambers, Bridge Street, London, S.W.1.

International Plastics Exhibition and Convention

The sixth International Plastics Exhibition and Convention will be held at Olympia, London, on 21 June–1 July 1961.

The Exhibition, organized by the Iliffe journal *British Plastics*, will again cover all aspects of the industry—basic and semi-processed materials, finished products, industrial components, and processing machinery and accessories. Fully representative displays of all types are expected from countries which are active in this field.

At the last International Plastics Exhibition in June 1959 more than 100,000 visitors came to Olympia, including nearly 9000 from overseas representing 81 different countries.

Full details about the 1961 Exhibition can be obtained from John L. Wood, Dorset House, Stamford Street, London, S.E.1.

Wiggin Nickel Alloys in Industry

The second of their exhibitions to be held in London was recently staged by Henry Wiggin and Company Ltd to show the part played by Wiggin nickel alloys in industry, and to help engineers and designers make the best use of these alloys.

The high-nickel alloys fall mainly into four groups, corrosion-resisting, heat-resisting, electrical-resisting, and materials with special physical properties. The exhibition included demonstrations of these properties and indicated the correct method of fabrication of the alloys.

Their industrial applications were shown by a large selection of actual components, sub-assemblies, and finished parts in which the Wiggin materials play vital roles.

Among these applications were examples in the aircraft industry, including a Nimonic 80A catalyst pack-retaining grid for a Super-Sprite rocket motor by The De Havilland Engine Company Ltd, and the disk and blades of a gas turbine rotor employing Nimonic creep-resisting alloys by Bristol Siddeley Engines Ltd. The marine field included an example of a variable pitch propeller with blade roots of K Monel by Slack and Parr (Marine) Ltd, and under chemical plant was included a hot-pressed dished head in Corronel 210 by G. A. Harvey and Company (London) Ltd. In the electrical field was shown a Saferod heater with an Inconel sheath enclosing the Brightray C element by Heatrae Ltd, and in electronics the printed circuits of an Avometer made in Ferry resistance alloy, by Technograph Printed Circuits Ltd, were shown.

Other fields where examples were shown included furnace equipment for the metal, ceramic, vitreous enamelling, and glass industries.

PETROLEUM IN PARLIAMENT

Motor Fuel (Methane)

The attention of the Minister of Transport was drawn on 25 February to the fact that lorries and omnibuses in Moscow were to be run on methane gas in order to prevent air pollution. He was asked what progress had been made in experiments on this subject in the U.K.

The Minister replied that although he had been aware of the theoretical potentialities of methane gas in this connexion for many years, the quantities available in Britain were not large enough to justify experiments of that kind.

Reference to the Monopolies Commission

Marcus Lipton (Brixton) asked the President of the Board of Trade on 15 March whether he had yet decided to refer the subject of petrol distribution to the Monopolies Commission, as there had been "no free and honest competition for years and years".

The Parliamentary Secretary to the Board of Trade replied that a decision had not yet been reached about new references to the Commission.

BRITISH STANDARD

The new British Standard BS 3223 : 1960 rationalizes specifications for calcium-base greases by providing a range of greases which satisfy the same general requirements for composition and quality, but differ in consistency and in the viscosity of the lubricating-oil component. Twelve categories of grease are included in the specification (three consistencies for each of four oil viscosity ranges) and standard designations are given.

Requirements are specified for: composition, consistency, change in penetration on prolonged working, drop point, free acidity and free alkalinity, water content, oil separation, and copper corrosion. Resistance to heat may be specified as an optional requirement for certain categories of grease. Where appropriate, IP methods of test are used. An appendix gives information on the suitability of greases for dispensing by means of lubricating equipment.

Copies may be obtained from the BSI, Sales Branch, 2 Park Street, London, W.1, price 7*s* 6*d* (postage extra to non-subscribers).

Trade Literature

The Selection and Installation of Perkins Marine Diesels

What should be an extremely interesting and useful booklet for boat-builders, marine engineers, and the Company's overseas distributors has been produced by F. Perkins Ltd, Peterborough, entitled *General Notes on the Selection and Installation of Perkins Marine Diesel Engines*.

Beginning with a description of the factors to be considered in selecting any particular type of marine diesel engine, the 51-page publication goes on to amplify this with the aid of tables and explanatory diagrams in a concise, practical, fashion.

A tabular chart gives a precise presentation of the types of craft normally encountered in service and the type of engine and reduction gear necessary for them to achieve certain speeds. This is followed by a guide table of propeller diameters for given engines and reduction gears. The means of engine installation, the various items of equipment involved, and the workings of the engines are carefully shown in text and illustration. The booklet concludes with brief specification details, power curves, and main installation dimensions, of each of the current Perkins marine diesel engines.

New Fungicide for Potato Blight

Two British companies, Pan Britannica Industries Ltd and Shell Chemical Company Ltd are to market American Dithane fungicide for potato blight spraying this season.

The development of the Dithane fungicides by Rohm & Hass Company, Philadelphia, has provided a group of chemicals—the dithiocarbamates—which are completely safe to the potato crop, even under conditions where a copper spray would result in a serious reduction in yield.

Further information should be obtained from Technical Service Department, Pan Britannica Industries Ltd, Waltham Abbey, Essex, or Public Relations Department, Shell Chemical Co. Ltd, 170 Piccadilly, London, W.1.

Cumene Hydroperoxide Sales

The Distillers Company Ltd, Chemical Division, who are selling agents for British Hydrocarbon Chemicals Ltd, announces that it now has cumene hydroperoxide available for sale in commercial quantities. Despatch can be made in 5-gallon polyethylene containers or in 45-gallon polyethylene-lined drums from stock at Grangemouth.

Sample quantities for evaluation, technical literature, and price quotations are available from The Distillers Company Ltd, Chemical Division, Devonshire House, Mayfair Place, Piccadilly, London, W.1.

Henry Wiggin Publications

The data book published by Henry Wiggin and Company Ltd on the Nimonic heat-resisting alloys has recently been revised.

The contents cover the complete properties of the alloys currently manufactured in the Nimonic series—Nimonic 75, 80A, 90, and 105.

The publication includes tables on mechanical and physical properties, creep characteristics, fatigue, and impact properties. A series of diagrams give detailed data on creep properties.

The Company has also published "An Introduction to Wiggin Nickel-Alloys", which indicates, mainly pictorially, the technical applications of high-nickel alloys.

The publications are obtainable free from Henry Wiggin and Company Ltd, Publicity Department, Thames House, Millbank, London, S.W.1.

UOP Acquires Control of Trubek Laboratories

Universal Oil Products Company has acquired controlling interest in The Trubek Laboratories, East Rutherford, N.J, manufacturers of speciality chemicals. The agreement provides for 100 per cent ownership within two years. No exchange of stock was involved, and the total payment by Universal is expected to be approximately $6 million.

The operations of Trubek are said to be distinctly complementary to those of Universal. The association will open new opportunities for Trubek to expand through the utilization of Universal's capital resources and research capabilities. Likewise it will benefit UOP by providing diverse markets for its new chemical developments.

Tank Gauging Equipment for Shell Refineries

Orders have been received by Firth Cleveland Instruments Ltd from the Shell International Petroleum Co. Ltd, on behalf of Shell Refining Co. Ltd, for Gilbarco-Firth Cleveland automatic tank contents gauges to be fitted to 51 petroleum storage tanks at the Stanlow and Shell Haven refineries. This will be the first major installation of this equipment in the U.K.

Each tank is to be equipped with a tank contents gauge, connected to one of five Gilbarco remote reading receivers. In addition, equipment for the remote reading of the average temperature of the tank contents is to be installed.

Butterfly-type Control Valves

Crosby Valve & Engineering Co. Ltd has added to its manufacturing programme at Crosby Works, Wembley, the comprehensive range of Mason Neilan Butterfly type control valves.

These are available in steel or cast iron as standard materials, as wafer type for mounting directly between pipe flanges, in sizes from 2–24 ft as standard. Light or heavy duty types are available according to the pressure drop across the valve and other service conditions.

Amongst other features, these valves can readily be changed on site from air to open, or air to close and from 60°–90° opening. The linkage is arranged so that the maximum possible mechanical advantage is achieved when the torque developed on the shaft by the flowing medium is at its greatest.

Prefabricated Desert Accommodation

J. E. Lesser & Sons Ltd, Green Lane, Hounslow, Middx, announces details of its Preline PB5 prefabricated buildings, designed and developed for providing comfortable sleeping and living accommodation in isolated desert areas. Of particular interest to any organization requiring desert accommodation which can be moved from site to site at short notice, they are prefabricated down to the last detail and are of stressed skin plywood construction. They are normally supplied complete with floor, designed to be laid direct onto level ground, but they can also be supplied mounted on steel skids for rapid transportation on low-loading trucks.

Water Softeners

The first of several publications in this field to be issued by the Company has just been produced by Head Wrightson & Co. Ltd, Ship House, 20 Buckingham Gate, London, S.W.1, giving an indication of the processes the Company has to offer in the field of water softening, and a general guide to the application of each process. It also gives information on other processes and specialist equipment which they provide.

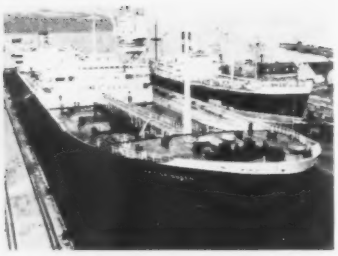
Fully Automatic Warehouse System

John Brown & Co. Ltd and the Solartron Electronic Group Ltd have formed a jointly-owned company, Solartron-John Brown Automation Ltd, 20 Eastbourne Terrace, London, W.2, for the application of their world (excluding the U.S.A.) exploitation rights of the Gumpertz system of automatic warehousing.

The system is electronic-electrical-mechanical in construction, and is said to offer a revolutionary change in warehouse control. Instead of conventional bins and shelving the warehouse is fitted out with rows of steeply slanting shelves, each carrying a single layer of one "line". A system of electronically controlled conveyer belts speed movement within the store.

The Gumpertz system, which will work in conjunction with any known system of office mechanization, enables an order of over a hundred "lines" to arrive at the delivery section in about 15 seconds after the input of the order. Electronic controls govern the entire operation; the automatic reading of orders; the grouped arrival of the components of the order at the delivery section, irrespective of their initial location; automatic checking; and provision of amended data required for automatic pre-invoicing or advice note printing.

The system enables one person to control the selection, assembling, and checking of more than 2000 orders per day. Its field of application is extremely wide, and is adaptable to the requirements of any industry.



Largest U.K. Tanker at Falmouth

The photograph shows the largest British-built and owned tanker—the BP Tanker Company's 50,000 dw ton *British Queen*—undergoing post sea trial examination at the new Queen Elizabeth Dock, Falmouth.

The new dock has a capacity in excess of the largest tanker capable of berthing at any existing British oil installation. One of its most important features is the use of specially-designed remotely-controlled bilge blocks, the first of their type in Great Britain. They can be traversed, raised, and lowered underwater as necessary to suit the varying underwater shapes of bottom of the vessel to which they are being applied. The use of these blocks obviate the need for side shoring, and the ship's sides and the dock are left unhampered.

All movements of the blocks are carried out by the use of pneumatic and hydraulic equipment manufactured by Holman Brothers Ltd, and Maxam Power Ltd, members of the Holman Group of Companies, Camborne, Cornwall.

New Shell X-100 Multigrade Motor Oils

Shell announces the introduction of two new Multigrade oils in the Shell X-100 range.

While retaining the viscosity/temperature characteristics and the general performance of the previous Shell X-100 Multigrades, these new oils leave no metallic ash in the combustion chamber. This feature has been made possible by the development of a combination of dispersant, anti-oxidant, and anti-wear additives which, unlike previous additive formulations, avoids the use of organo-metallic compounds.

The new oils will replace the existing Shell X-100 Multigrades and will be available in 10W/30 and 20W/40 classifications. The price will be unchanged and they will be generally available.

New Fluid Coking Process

A new model of the fluid coking petroleum refining process for the conversion of low-value oil materials into gasoline and home-heating oil has been developed by Esso Research and Engineering Company.

A by-product of the process is a finely-divided coke resembling black sand, which is being used as a public utility fuel, in the smelting industry, and is expected to have other applications in the future. The new version, known as "Model II Fluid Coking", can be installed and operated at up to one-third less cost than the original model which was introduced in 1953.

Exhaustive engineering studies permitted great simplification of the feed and recycle systems. The number of reactor feed nozzles, for example, has been reduced 67 per cent and certain heat exchangers and pumps have been eliminated. Radioactive tracer studies contributed to the simplification of various systems in the process.

Utility costs could also be cut up to 35 per cent by the application of a unique waste gas turbine to drive the burner air blower and by other operating economies, including the elimination of externally-provided high pressure steam.

Seven fluid coking units with a total capacity of more than 100,000 bd are installed in various parts of the U.S.A. and Canada.

The process is made available to the industry under license.

Metering Pump

The recently-announced Metrivar pump type K is a small-capacity variable output pump driven by a totally-enclosed vertical spindle 50 cycle motor and manufactured by Metering Pumps Ltd, 21 The Mall, Ealing, W.5. A reduction gear is incorporated and any of three pump speeds can be specified. Capacities (on 50 cycles) range from 0·35 to 3·6 gal/hr at maximum working pressures ranging from 50–500 psi, depending on the type of pump head and stroke speed.

The pump ram is guided and supported in the gear box fixing, and does not depend upon any part of the pump head for its alignment. It is, therefore, possible to use such materials as 18/8 stainless steel for the ram and all parts of the pump head.

Sweetening Plant for Kirkuk

Foster Wheeler Ltd has been awarded a contract for the design, supply, and construction of a crude oil sweetening plant to handle 250,000 bd of Iraq crude oil, to be erected at Kirkuk for the Iraq Petroleum Company Ltd. This plant will be similar to eleven plants of smaller capacity previously designed and erected by Foster Wheeler at the same location, and is required primarily for the removal of hydrogen sulphide together with light hydrocarbons from the crude oil before pumping through the pipeline to the Mediterranean coast. It is also necessary to take care of the increased production from the Kirkuk oilfield for which arrangements are already in hand in connexion with the expansion of the existing Kirkuk–Mediterranean pipeline.

The value of the Foster Wheeler contract is over £500,000. All design work is to be carried out in Britain and substantially all materials will be supplied from there.

New Pressure Transducer

J. Langham Thompson Ltd, 76 High Road, Bushey Heath, Herts, announces a new transducer for measuring steady and fluctuating pressures up to a maximum of 20,000 psi.

Smaller than its predecessor, Model BP3 may be used with all such fluids as are compatible with beryllium copper, but when non-compatible corrosive fluids are present, an all stainless steel version, known as BP6, should be used. The sensing element consists of a beryllium copper cylinder and a 4-arm strain gauge bridge network. The full range output is 1·5 mV/V applied and the overall accuracy is better than 0·5 per cent which includes linearity and hysteresis.

Oil Burner Adjustment and Testing Kits

Instruments required for the rapid installation and adjustment of vaporizing oil burners are described in a pamphlet itemizing such equipment manufactured by Shandon Scientific Co. Ltd, 6 Cromwell Place, London, S.W.7.

Purifier Installation at Southampton Gas Works

The first set of purifiers to be specifically designed to take advantage of the principle of rapid rotation was commissioned in December 1959, at the Southampton works of the Southern Gas Board. These purifiers, which were installed for the purpose of removing hydrogen sulphide from refinery gases at the inlet of the reforming plant, were designed and constructed by the Chemical Engineering Division of W. C. Holmes and Co. Ltd to the order of Messrs Humphreys & Glasgow Ltd.

The nominal capacity of the purifiers is 2·6 million cu ft of gas/day, containing up to 1200 grains of hydrogen sulphide per hundred standard cu ft. The gas flow is cyclic at an operating pressure of 9 psi. The purifiers are fitted with Homes Western "55" gas valves which are automatically operated by Lockheed hydraulic cylinders.

Acheson Colloid's Golden Jubilee Presentation

In March this year Acheson Colloids Ltd celebrated, not only its Golden Jubilee, but also fifty years' association with the City of Plymouth. To mark this long association the Company presented a silver "Standing Salt", a traditional piece of ceremonial plate of historical and sociological significance, to the City of Plymouth at a civic reception.

The silver piece, which was designed by Reginald H. Hill, M.S.I.A., incorporates many historical symbols and heraldic devices associated with the City.

Acquisition by Metal Propellers

Metal Propellers Ltd, of Croydon, Surrey, has acquired The Standard Steel Co. (1929) Ltd, who occupy adjoining premises on Purley Way, Croydon.

The Standard Steel Co. are steel stockists and constructional and mechanical engineers who undertake the supply and erection of structural steelwork of all types.

Gallenkamp-Towers Publication

The first issue of Gallenkamp-Towers' new publication *News & Review* is now available. To be published by A. Gallenkamp & Co. Ltd, Technico House, Sun Street, London, E.C.2, twice a year, the new publication will give details of the progress and effects of the new structure and range of equipment of the two companies.

Particulars of regional distribution services, available publications, and some equipment of special interest are included in this first February issue.

New Six-Cylinder Industrial Diesel

A new five-litre, six-cylinder industrial diesel engine suitable for many different applications, including tractor shovels, fork lift trucks, and mobile cranes, is announced by Perkins Engines Ltd, of Peterborough.

Named the Six 305(I), it is rated up to 87 bhp at 2400 rev min for intermittent use, and is fitted with chrome-plated thin wall liners. These will greatly reduce bore wear when the engine is used under dusty, adverse, conditions.

Fitted with a compact flange-mounted distributor-type fuel pump, it can be equipped with either a hydraulic governor for types of industrial equipment requiring engine speeds in excess of 2000 rev min or a mechanical governor for applications such as generating and pumping sets, needing close governing.

Turner Brothers Asbestos Co.

Welcome to Turners is the title of a new publication issued by Turner Brothers Asbestos Co. Ltd, P.O. Box No. 40, Rochdale. It tells the story of the development of the Company and indicates its ramifications and range of activities covering the fields of asbestos textiles, belting, and plastics reinforcement.

UKAEA Contract for Mitchell Engineering

A comprehensive order was recently received by Mitchell Engineering Ltd, 1 Bedford Square, London, W.C.1, from the UKAEA for an emergency quick-starting automatically-controlled oil-fired package boiler of 66,000 lb hr, oil tank farm facilities, and other civil engineering work.

Pye Scientific Instruments

A new edition of the Pye Scientific Instrument Catalogue is now available, and describes several new developments which will interest all those concerned with scientific research or industrial production testing and process control.

Copies of the new Catalogue "N", which supercedes all previous editions, can be obtained from W. G. Pye & Co. Ltd, Granta Works, P.O. Box 60, Cambridge.

Metal Deactivators and Sequestering Agents

Robinson Brothers Ltd, Ryders Green, West Bromwich, announces that 1·4-di (carboxymethylthio) butane and 2·2-di (carboxymethylthio) diethyl ether are available in experimental quantities.

Their suggested use is as metal deactivators or sequestering agents in those cases where ethylene diamine tetra-acetic acid (EDTA) or its homologues are ineffective, especially in acid or non-aqueous media. A technical data sheet is available on application.

Rocol to Exhibit Products in the U.S.A.

Rocol Ltd, Rocol House, Swillington, Nr Leeds, will be the only manufacturers of specialized lubricants for industry and automobiles in the British Exhibition to be held in New York in June this year.

The display of products, including special radiation-resisting lubricants which have been developed as a result of the lubrication of Calder Hall and other atomic power stations, will offer a complete service to industrialists and show the immense range of purposes for which Rocol lubricants are suitable.

First Hydrar Plant on Stream

The first commercial Hydrar unit for production of high purity cyclohexane from benzene has gone on stream at Gulf Oil Corporation's refinery at Port Arthur, Texas.

This latest addition to Gulf's petrochemical processing facilities was designed by Universal Oil Products Company and built by Procon Inc. It will add significantly to the U.S.A.'s total supply of cyclohexane, and will produce a high-purity grade especially adapted to the manufacture of nylon. Cyclohexane is also used as a solvent in the manufacture of plasticizers and synthetic lubricants.

Feed stock for the unit is supplied by an adjacent benzene plant, which includes UOP-designed Hydrobon-Platforming-Udex installations.

The world's second Hydrar unit is now under construction at Ponca City, Oklahoma, for Continental Oil Company. Capacity of the Conoco unit will be 20 million gallons of cyclohexane per year.

Its completion is scheduled for next September, and benzene feed stock and hydrogen will be supplied by Conoco's catalytic reformers.

Oil-on-Water Detector

An oil-on-water detector to combat the pollution of effluent has been developed by Smiths Industrial Instrument Division, Chronos Works, N. Circular Road, London, N.W.2. One of these has been installed at the Mobil Oil Co. Ltd's oil terminal at Ellesmere Port, Cheshire.

The detector is designed to give warning when an excessive amount of oil has accumulated in an interceptor tank, where storm water collects prior to discharge. When a layer of unwanted oil reaches a predetermined level the detector provides a signal to de-energize a solenoid; this causes a butterfly-valve trip mechanism to fall and close a valve in the storm water outlet pipe. Once the butterfly-valve trip mechanism has operated, the interceptor tank and skimming pond must be cleared of oil before the solenoid can be re-energized and the butterfly linkage manually re-engaged to open the valve.

Process Plant Contracts for Canada and India

Brockville Chemicals Ltd, of Canada, has awarded a contract to P.G. Engineering Ltd and its associated company Power-Gas Canada Ltd for the complete design, construction, and commissioning of a hydrogen plant at a new works now in course of erection near Maitland, Ontario. The plant will produce 15 million cu ft of hydrogen daily, mainly for ammonia synthesis, using as a feedstock natural gas delivered by pipeline from western Canada. It will consist of Texaco partial oxidation units operating at about 400 psig, and carbon monoxide in the Texaco gas will be converted to hydrogen and carbon dioxide in a P.G. design of pressure conversion plant using P.G. catalyst; carbon dioxide will be removed from the converted gas by the Benfield hot potassium carbonate and monoethanolamine absorption processes.

In addition, P. G. Engineering Ltd has received a contract from Fertilisers & Chemicals Travancore Ltd, south India, for a Texaco partial oxidation gasification plant to produce carbon monoxide and hydrogen, followed by high pressure CO conversion, removal of CO_2 and residual H_2S by water scrubbing. Initially the plant will process naphtha, but is laid out so that if fuel oil is to be used the additional acid gas purification plant can be added. One of the interesting features of this plant is that carbon produced in the Texaco generator is recovered and recycled.

The flexibility of the Texaco process is particularly suitable for Indian conditions, as alternative fuels such as refinery gas, natural gas, naphtha, and fuel oil can be readily processed.

Expansion of Head Wrightson Operations

Head Wrightson Processes Ltd has formed an Industrial Furnace Division at its London offices, 20-24 Old Street, London, E.C.1, to strengthen the services at present offered to the petroleum and chemical industries in the U.K. and abroad.

Many designs are marketed, each for specialized types of duty, including the "Convetube" upshot heaters, which can be fired by either gas or oil, and which are individually designed to meet a wide variety of industrial applications ranging in heat absorption duties from 300,000 to over 60 million Btu hour.

Cambridge Instruments

Recent brochures published by Cambridge Instruments Co. Ltd, 13 Grosvenor Place, London, S.W.1, give a summary of their complete range of instruments, indicating the kinds of measurement undertaken by the Company; their gas analysers for hydrogen-cooled alternators; and the thermometer regulators stock models for immediate delivery.

Look—Clean Hands

The Rt Hon Ernest Marples, M.P., Minister of Transport, inspected the showroom of Wakefield Lubrequipment during a recent visit to Castrol House. Here he is being shown a wall panel installation by A. V. Jay, manager, Lubrequipment Department.

Sahara Crude Stabilization Plant

Construction work is being carried forward rapidly on the expansion of a crude oil stabilization plant at Hassi Messaoud to increase output to 100,000 bd of crude from the Sahara oil fields of the Compagnie Française des Pétroles (Algérie).

Initial components of the plant, located 420 miles southwest of Algiers, and designed and built by Stone & Webster, are already producing 54,000 bd.

An unusual feature of the plant design was the effective removal of very large quantities of wild gas from the well fluids. This was done in a manner to retain maximum practical amounts of stabilized crude oil with the most economic plant.

At present the separated gases, totalling 75 million cu ft daily, are being flared. Ultimately, however, after removal of liquefied petroleum gas some of the gas may be re-injected into the reservoir. It will also be used in gas turbines to produce the total electric power requirements of the field.

Combustion Additives for Marine and Industrial Use

A new powder additive, in a soot stick form, for the treatment of boilers is being produced by The Amber Chemical Company Ltd, 11a Albemarle Street, London, W.1.

The combustion additive, Amber SSR 117, can be used for the treatment of all types of marine or industrial boilers, using either liquid or solid fuels. It enables boilers to be operated at maximum efficiency, reducing the frequency of tube-cleaning, with a resultant saving in maintenance time and labour costs. Heat transfer is increased and the combined advantages of the additive enable boilers to be satisfactorily operated over longer periods of time.

Further data are also now vailable on Amber SSR 511, a marine fuel oil additive, manufactured by The Amber Chemical Company Ltd, and designed primarily to overcome sludge and other problems associated with the burning of heavy fuel oil.

Contracts for Tanker Pumps

Plenty & Son Ltd, of Newbury, Berkshire, has received two repeat orders in the last six months each for two 150 tons per hour variable-capacity remote controlled cargo and ballast pumps for Esso Petroleum Company Ltd's tankers, and also a fourth order for two 400 tons per hour cargo pumps for the same owners.

Audco Valves

Publication No. 594 on power operation and remote control, issued by Audley Engineering Co. Ltd, Controls Division, Eastern Avenue, Gloucester, gives details of the range of Audco valves and their associated equipment, and includes information on the new Nos. 1 and 7 actuators.

Flameproof Lighting for Hazardous Areas

The latest industrial lighting catalogue, L 600 1, issued by Victor Products (Wallsend) Ltd, PO Box 10, Wallsend-on-Tyne, presents details of their extensive range of flameproof fittings specifically designed for use in oil refineries, petrochemical plants, and other installations requiring flameproof, vapourproof, and dustproof fittings.

In addition, a fitting which is flameproof and weatherproof is available for use in remotely dangerous areas.

ICI Titanium Booklets

Two further booklets in the ICI Metals Division's publications on ICI wrought titanium are now available. These, Nos. 2 and 4, are entitled *Physical and Mechanical Properties*, and *Fabrication*, respectively. The first covers the properties of both commercially pure titanium and titanium alloys, and the other includes machinery and grinding, hot working, forming, annealing, descaling and surface treatment, welding, and brazing and soldering.

Yokkaichi Ethylene Plant for Mitsubishi

Stone & Webster Engineering Corp has been engaged to design and assist in the engineering and construction of a second ethylene plant for Mitsubishi Petrochemical Co. Ltd. The plant is to be located at Yokkaichi, near the industrial seaport of Nagoya, and is scheduled for completion in 1961.

Under the contract Stone & Webster will provide design and other engineering services, as well as assistance during construction and initial operations. Detailed engineering will be done in Japan. Materials and equipment will be supplied by Japanese industry, and all construction work will be done by Japanese craftsmen.

The first ethylene plant was completed at Yokkaichi in the spring of 1959.

New Type Flowmeter to be Made in U.K.

De Havilland Propellers Ltd, under the terms of a licence agreement concluded recently with the Potter Aeronautical Corp of New Jersey, is now developing and producing a flowmeter of a type which has not previously been manufactured in Great Britain. It is to be known as the de Havilland Pottermeter.

A turbine-type flowmeter, the Pottermeter is used by all the American manufacturers of guided weapons. Whilst there are already a number of turbine-type meters on the market, it is said that none embodies the unique Potter "Pull-up" principle which does away with thrust bearings, enabling the rotor to flow freely in the stream of fluid. This design feature is said to give greater accuracy combined with increased reliability when compared with other types of flowmeter, and enables the Pottermeter to measure the flow of liquids irrespective of their lubricating or non-lubricating properties.

De Havilland Propellers proposes to continue the development of the Pottermeter, and of its associated equipment, which enables it to be used for volumetric and mass flow measurement and control, for blending and batching of fluids, and for leak detection. Flowmeters will be available in sizes from ½ in up to 22 in diameter, which cover a flow range of 1/10gal min up to 40,000 Imp gal min, and will be suitable for use in the chemical, petroleum, oil, food liquids, water, and many other industries.

Petrolite Factory Completed

Final installations and production plant schedules are now complete at the new manufacturing facilities of Petrolite Ltd, located at Birchill Road, Kirkby Industrial Estate, near Liverpool.

The plant was scheduled to begin commercial production about 1 April 1960, and will manufacture a selected line of Petrolite oil industry chemicals.

Reset Indicators in Automatic Lube System

Exactor Ltd, Church Way, Edgware, Middlesex, announces a new "trouble" indicator for use with its Exactor-Trabon centralized grease and lubricating systems. This new indicator fits into the Exactor distributor unit which feeds automatically to each bearing in turn a measured "shot" of lubricant, and is available for a range of operating pressures from 250–2500 psi.

A leaflet describing the new warning indicators and the Exactor-Trabon centralized lubrication system is available from the makers.

Gordon Temperature Measuring Instruments

A leaflet received from James Gordon & Co. Ltd, Dalston Gardens, Stanmore, Middlesex, describes the range of their temperature measuring instruments suitable for power plant, industrial boilers, heating and ventilating installations, and other industrial purposes. This range includes the Elliott indicating and recording thermocouple pyrometers and electrical resistance thermometers, and the Bristol's filled system thermometers.

Flexibox Mechanical Seals at Montreal

Flexibox mechanical seals have been adopted for sealing the glands of 147 pumps at the new BP Montreal refinery. The figure covers, in general, all process pumps plus other rotary equipment, including boiler feed water pumps.

Both balanced and unbalanced seals manufactured by Flexibox Ltd, Nash Road, Trafford Park, Manchester 17, are employed. Arrangements are provided where necessary for cooled circulation of the product past the seal faces to remove frictional heat and to prevent the settling-out of sediments and polymers. Double seal units with a neutral liquid circulating between the individual seals are employed for certain applications where the operating conditions are particularly arduous. Flexibox PTFE-fitted seals are used for the handling of corrosive fluids.

Union Carbide Glasgow Office

The Glasgow office of the Alloys Division of Union Carbide Ltd is now operating from Cornhill House, 144 West George Street, Glasgow, C.2.

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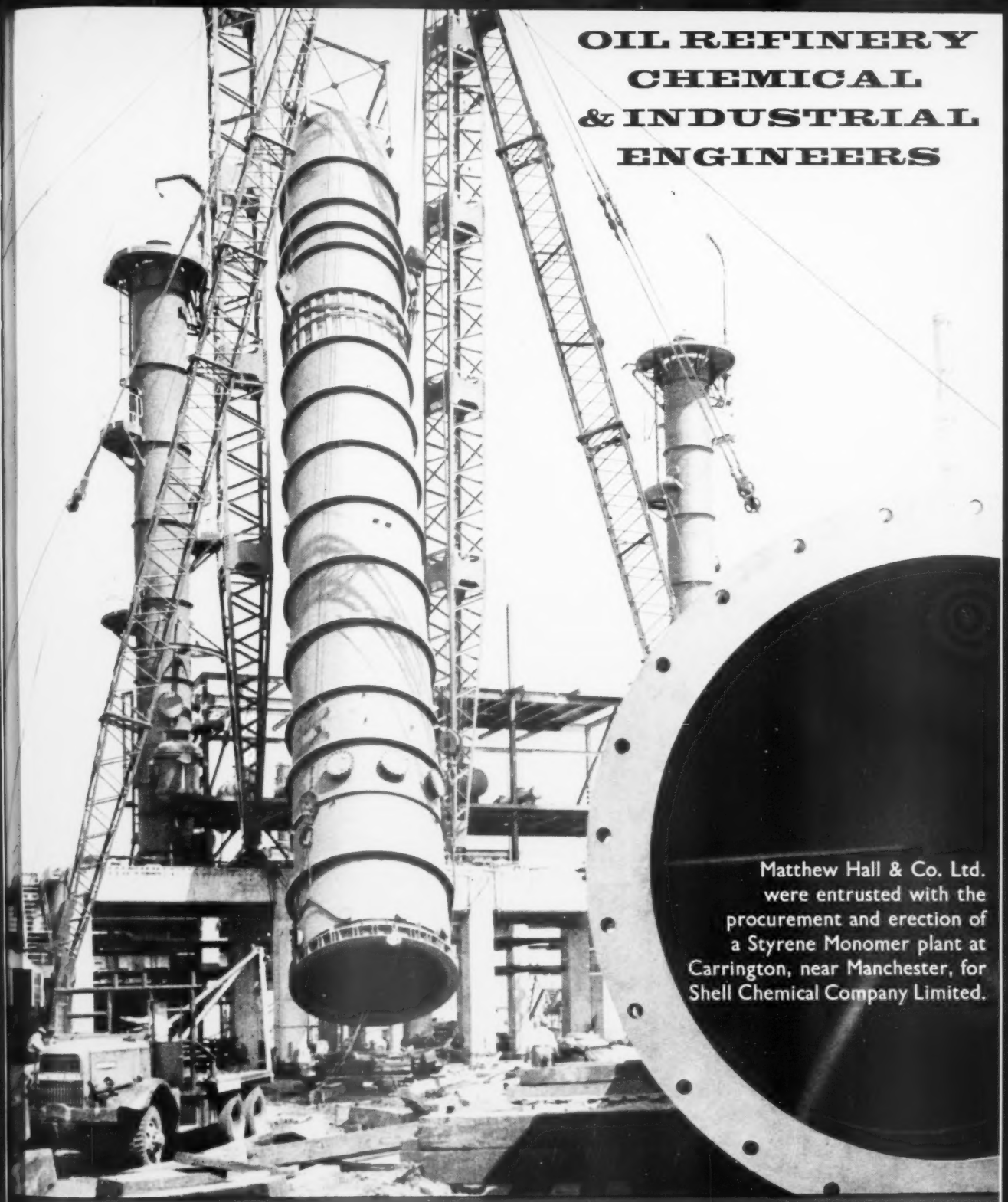

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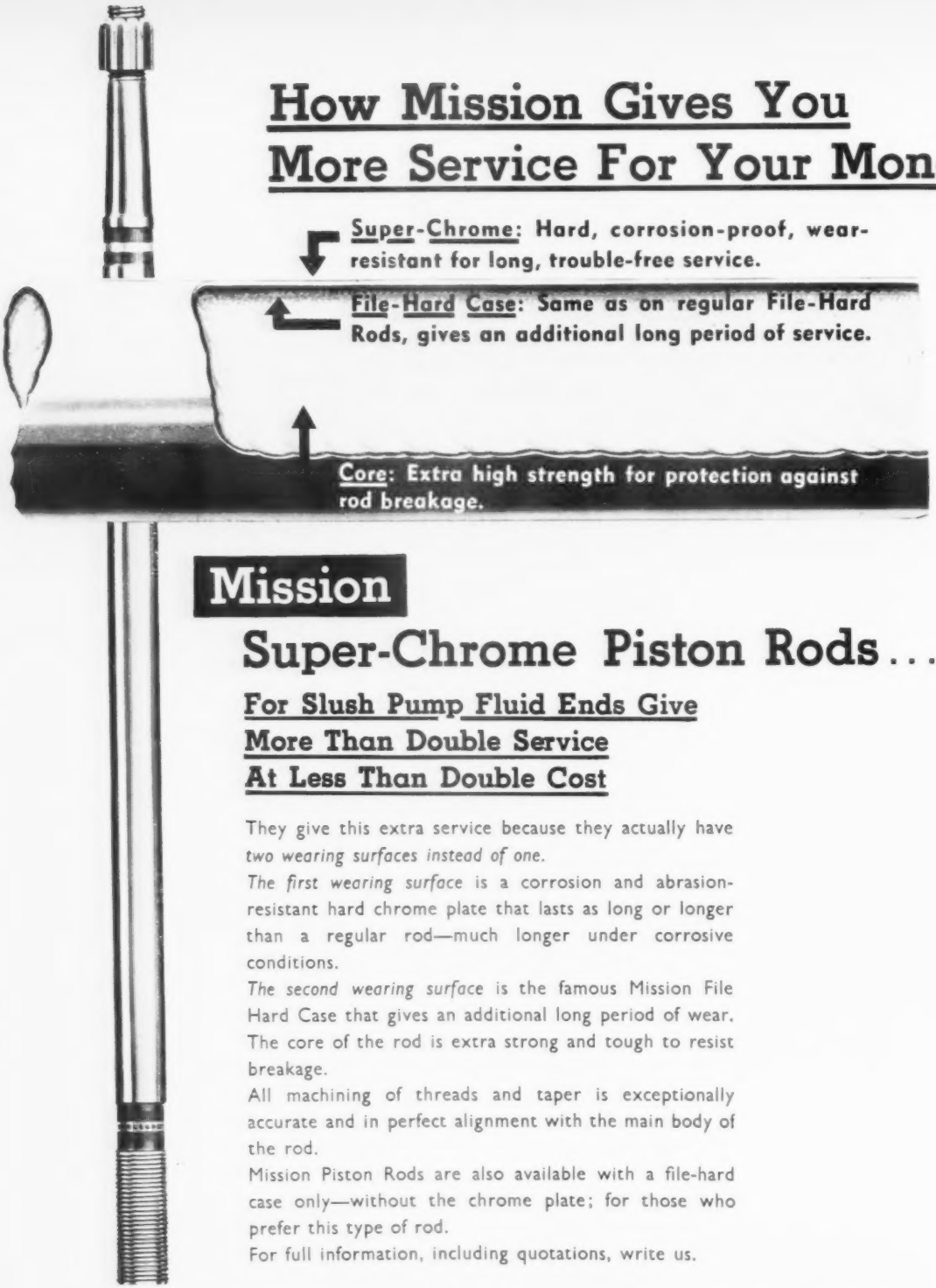
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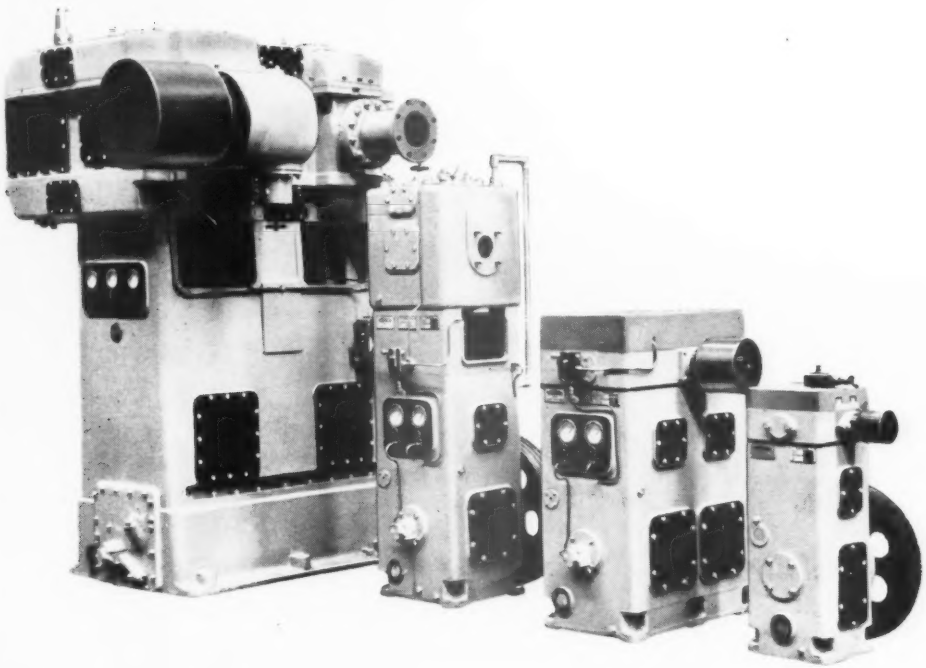

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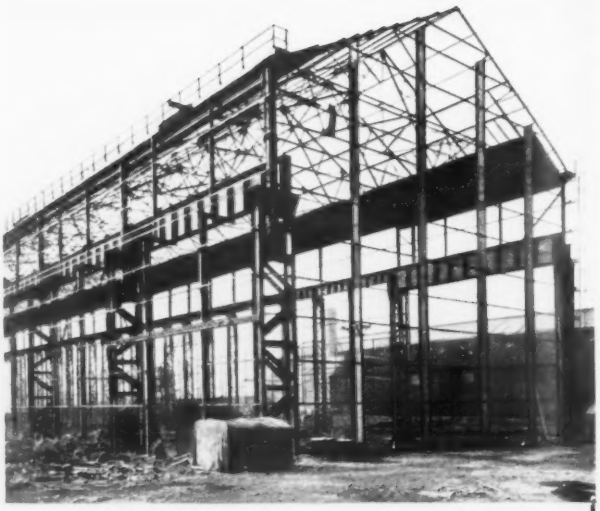

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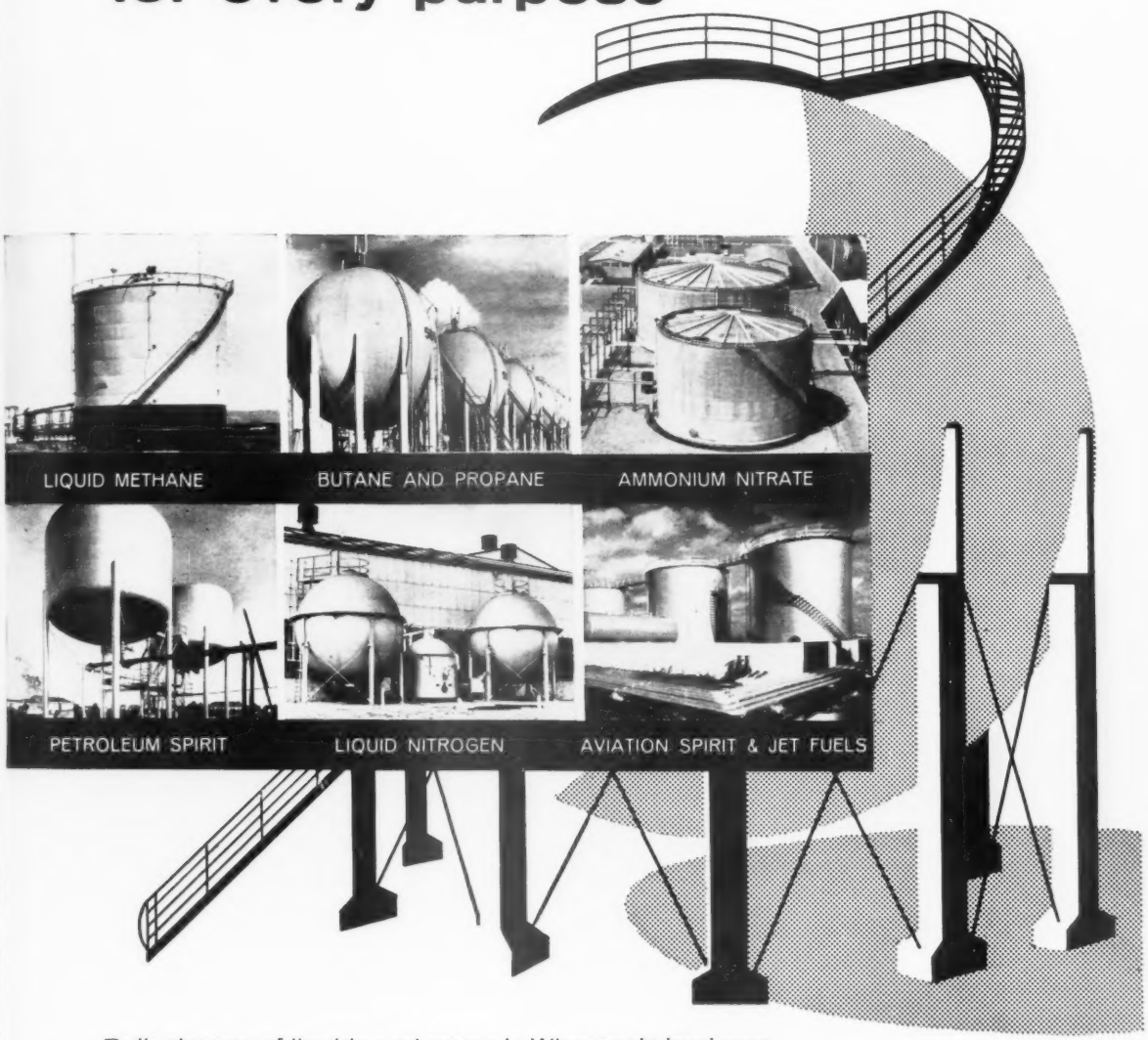

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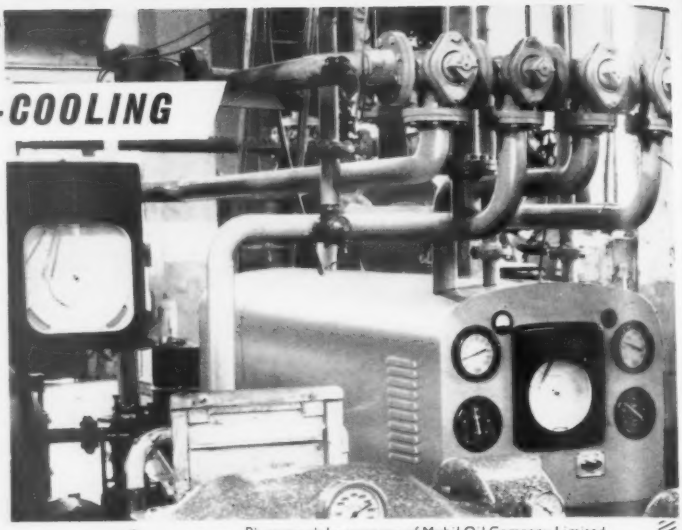

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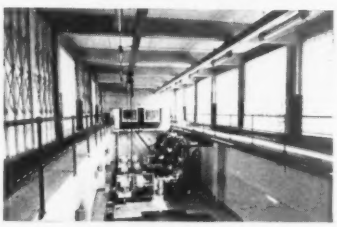
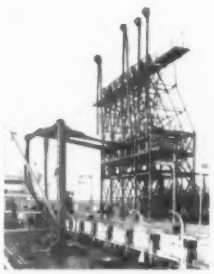
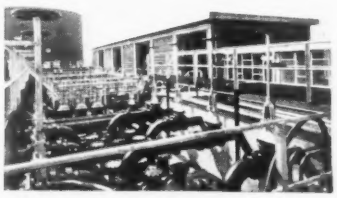


Interior of new electric pump house. Pumps ensure rapid delivery of the heaviest fuel oils.





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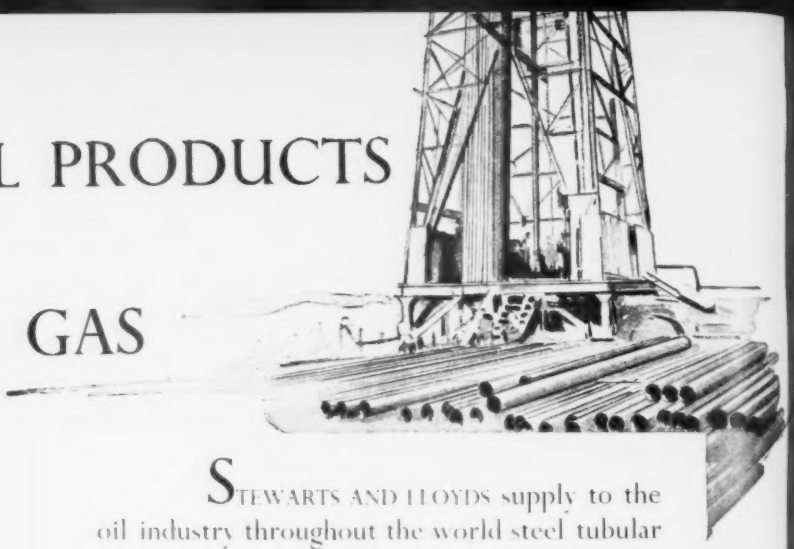

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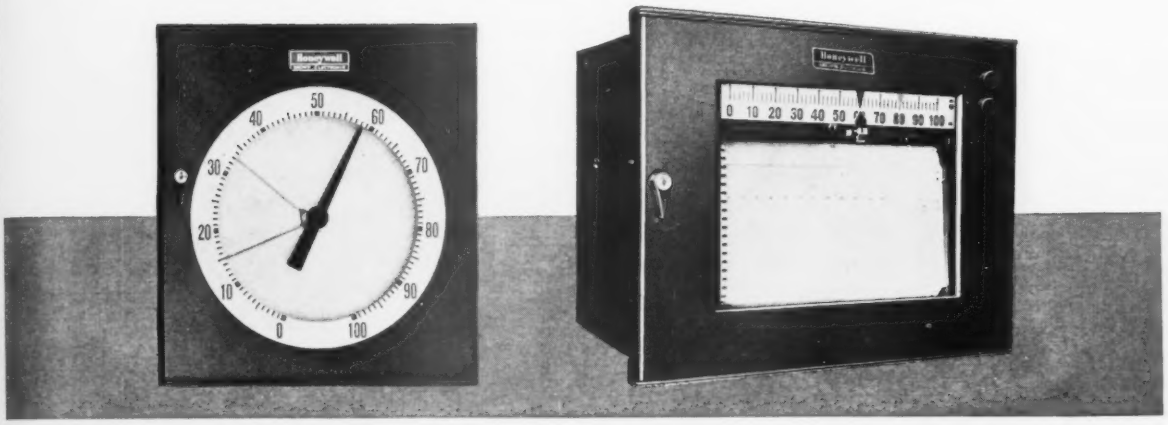

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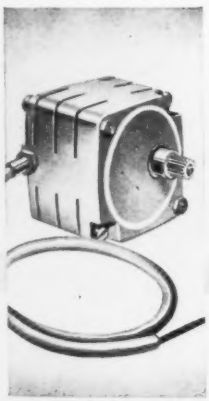

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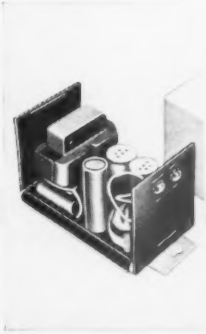

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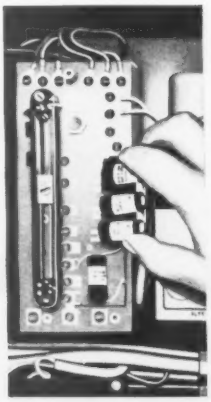
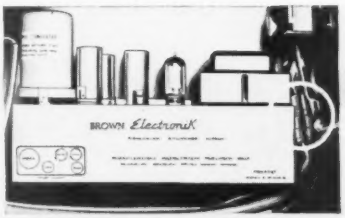


3 Measuring Circuit Module



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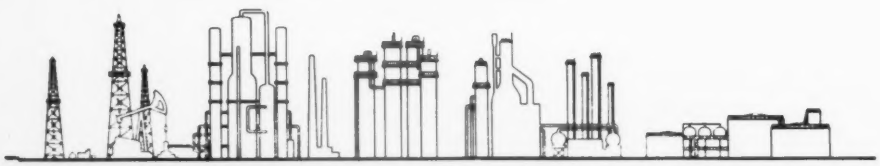

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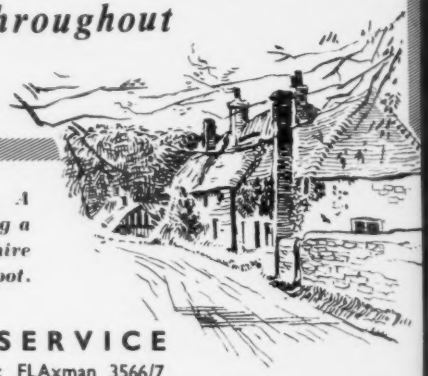

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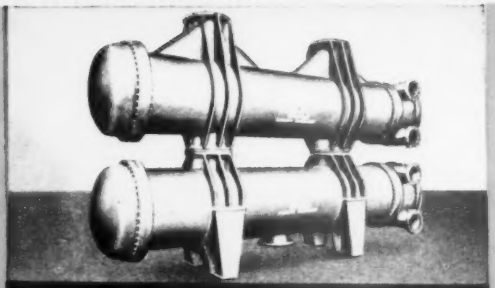

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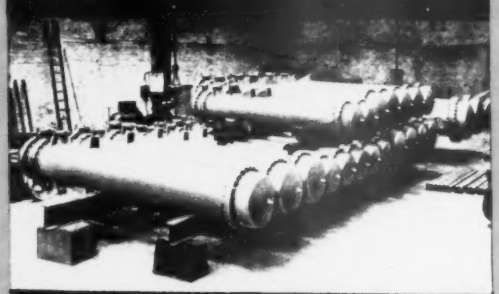

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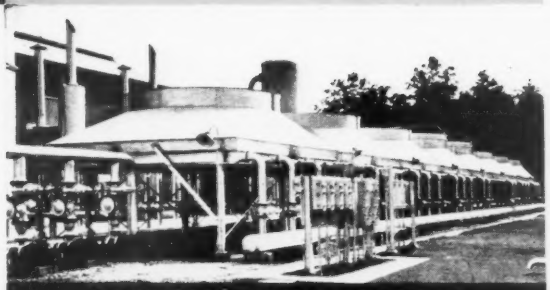
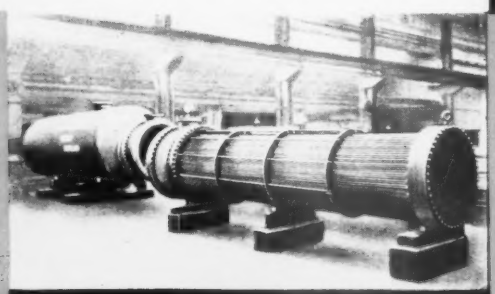
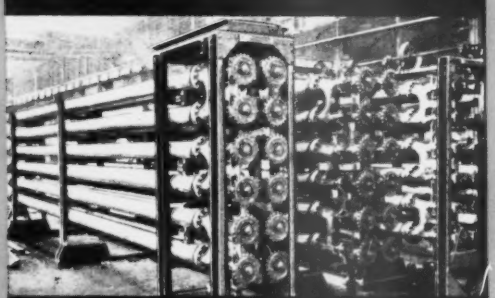


Craig-Hudson Solo-Air Exchangers -induced draught



Reboiler Shell and Tube Bundle



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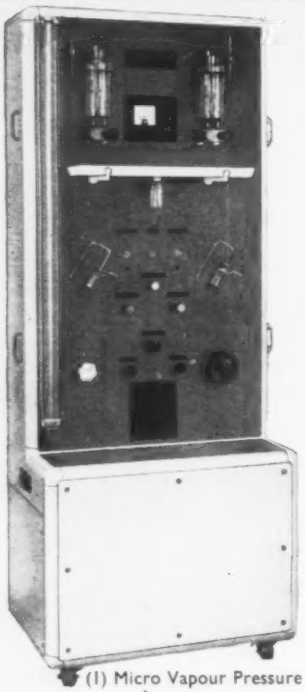

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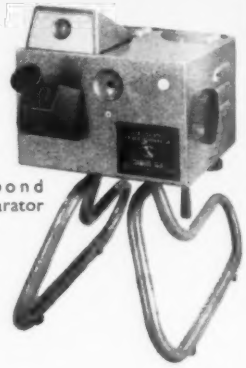

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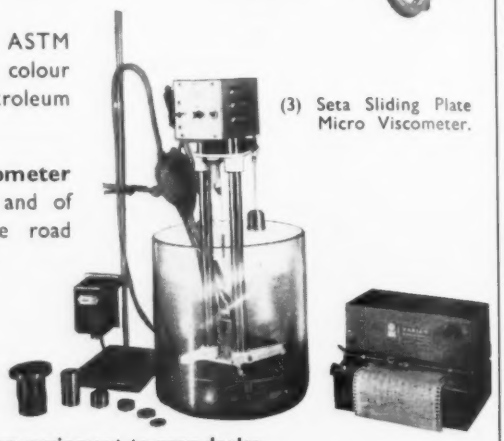

(3) Seta Sliding Plate Micro Viscometer.

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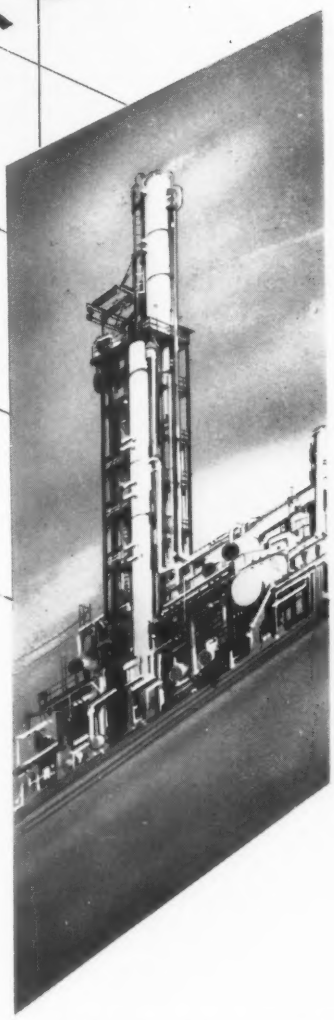

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